FINAL

ENVIRONMENTAL ASSESSMENT

of the

INTERIM FINAL RULE

amending the

ATLANTIC LARGE WHALE

TAKE REDUCTION PLAN

SEASONAL AREA MANAGEMENT

DECEMBER 2001

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
DEPARTMENT OF COMMERCE

Prepared by: NMFS, Northeast Region
Draft EA:
Final EA: December 28, 2001

Contents

1.0 INTRODUCTION

Pursuant to Section 118 of the Marine Mammal Protection Act (MMPA), the National Marine Fisheries Service (NMFS) convened the Atlantic Large Whale Take Reduction Team (ALWTRT or Team) to develop a plan for reducing the incidental by-catch of large whales in four commercial fisheries along the Atlantic coast. The Team consists of representatives from the fishing industry, the New England and Mid-Atlantic fishery management councils, state and federal resource management agencies, the scientific community, and conservation organizations. The immediate goal of the Team was to draft an Atlantic Large Whale Take Reduction Plan (ALWTRP) to reduce the incidental take of the four primary large whale species that interact with fisheries - the North Atlantic right whale (Eubalaena glacialis), humpback whale (Megaptera novaeangliea), fin whale (Balaenoptera physalus), and minke whale (Balaenoptera acutorostrata) - to a level less than the potential biological removal level (PBR) within six months of implementation of the Team's plan.

Following the ALWTRT's initial set of meetings, the NMFS developed a proposed Plan published on July 22, 1997 (62 FR 16519), which was later modified and finalized on February 16, 1999 (64 FR 7529). Additional gear modifications were published as an interim final rule in December 2000 (65 FR 80368). The main tools of the plan include basic prohibitions on killing or injuring whales as well as a combination of broad gear modifications and time-area closures, which are being supplemented by progressive gear research, expanded disentanglement efforts, and extensive outreach efforts in key areas.

2.0 PURPOSE AND NEED

The purpose of this document is to examine the impacts to the environment that would result from the issuance of an interim final rule that would implement a seasonal management system to provide further protection for large whales, with an emphasis on North Atlantic right whales. The interim final rule would provide a Seasonal Area Management (SAM) program to protect predictable annual concentrations of North Atlantic right whales in the waters off Cape Cod and out to the Exclusive Economic Zone line. NMFS has defined two areas, called SAM West and SAM East, in which gear restrictions for lobster trap and anchored gillnet gear would be required.

The need for this protective measure is also driven by the goals of the MMPA and ESA. Under the 1994 Amendments to the MMPA the goal is defined to be reduction of takes in commercial fishing operations to below PBR within 6 months of Plan implementation and to achieve zero mortality rate goal (ZMRG) within 5 years of Plan implementation. For right whales these two goals are essentially the same as PBR has been defined as zero. Since the current incidental take for right whales exceeds PBR and does not achieve ZMRG, additional risk reduction is necessary. Under the ESA, the NMFS is obligated to ensure that actions authorized by the agency, such as fishing in federal waters, are not likely to jeopardize the continued existence of right whales.

Although there is not consensus on the details of implementation, the Team, states and NMFS have all identified Seasonal Area Management (SAM) as an appropriate tool in the risk reduction strategy.

2.1 BACKGROUND

The complete background for the ALWTRP is found in Section 2.1 of the Environmental Assessment (EA) published on July 15, 1997 (NMFS 1997). The following background section is in reference to the specific actions to implement Seasonal Area Management to protect right whales sighted outside designated critical habitat areas.

The February 1999 final rule implements the regulatory tools of the ALWTRP which included a combination of broad gear modifications and time-area closures. However, the regulatory portion of the ALWTRP is supplemented by progressive gear research, expanded disentanglement efforts, extensive outreach efforts in key areas, and an expanded right whale surveillance program to supplement the new Mandatory Ship Reporting System.

The Team met on February 22-24, 2000, to determine how to adjust the current Plan to further reduce the possibility of entanglement of large whales, primarily the right whale, in lobster and gillnet gear. The Team was informed of the sense of urgency in this task given the continued entanglement of right whales in the face of clear evidence that the population is declining. There was a general understanding from available entanglement data that right whales may encounter fixed gear anywhere. Therefore, the Team looked for measures that could be broadly applied, to supplement the existing time-area closures that are being applied to right whale critical habitat. Following discussion on various alternative actions, the Team recommended that the existing requirement for fishermen to use gear modifications from the Lobster and Gillnet Gear Technology Lists be replaced with specific gear modifications. Data from the last three years of NMFS gear research demonstrated that mandatory gear modifications are cost effective, operationally acceptable to the fishermen, and have a reasonable chance of providing additional entanglement risk reduction for large whales. The Team agreed that the likelihood of right whale movements through State waters was low enough to not require additional regulations within State waters at this time. On December 21, 2000 (65 FR 80368), an interim final rule was published which incorporated the Team's recommendations. The modifications contained in the interim final rule only apply to the New England anchored gillnet and lobster trap fisheries and the Mid-Atlantic lobster trap fishery. The new requirements became effective on February 21, 2001.

The December 2000 interim final rule modifies the February 1999 final rule by changing gear requirements for the lobster and gillnet fisheries in the Northeast segment of the ALWTRP. Components of the December 2000 IFR include the following:

- Nearshore and offshore lobster waters were redefined to be consistent with the American Lobster Fisheries Area designations

(Areas 1 through 5, and the Outer Cape Management Area);

- The following new gear requirements were imposed for lobster fisheries in the Offshore Lobster Waters (Area 3 and the Area 2/3 overlap):
  - Knotless weak links at the buoy with a breaking strength of 3780 lb or less
  - Gear marking midway on the buoy line

- The following new gear requirements were imposed for lobster fisheries in the Northern Nearshore Lobster Waters (Areas 1,2, and the Outer Cape Management Area):
  - Knotless weak links at the buoy with a breaking strength of 600 lb or less
  - Multiple trap trawls only – single trap trawls were not allowed
  - Limit of one buoy line on all trawls up to and including 5 traps
  - Gear marking midway on the buoy line

- The gear technology list was eliminated for the sink gillnet fisheries in the Northeast gillnet waters (East of 72°30'W Long.). The gear requirements imposed were:
  - Knotless weak link at the buoy with a breaking strength no greater than 1,100 lb.
  - Weak link placed in the headrope (floatline) at the center of each net panel
  - Net strings that contain 20 net panels or less must be anchored with one of three optional anchoring systems
  - Gear marking midway on the buoy line

- The Lobster Gear Technology list was changed to reduce the breaking strength for the buoy weak link option to 600 lb or less and require it to be knotless.

Pursuant to Section 7 of the Endangered Species Act (ESA), the NMFS has recently reviewed the effect of fishery management activities on species listed as threatened or endangered. On June 14, 2001, the NMFS issued biological opinions (BOs) for the monkfish, spiny dogfish, and multispecies Fishery Management Plans (FMP) and Federal regulations for the lobster fishery. It was concluded that fishery management actions as proposed had the potential to jeopardize the continued existence of right whales. A reasonable and prudent alternative (RPA) was included in the BOs, which contains a number of measures necessary to avoid jeopardy. One component of the RPA is Seasonal Area Management (SAM), the subject of this EA. The RPA established a deadline for a proposed rule for SAM by September 30, 2001, and a final rule by December 31, 2001, with the goal of having SAM in place prior to the next spring migration of right whales.

In addition to promulgating an interim final rule for SAM, NMFS is concurrently drafting final rules which would implement a program for Dynamic Area Management (DAM) and ALWTRT recommended gear modifications to the ALWTRP, as well as those modifications determined by NMFS as necessary for lobster trap gear in the offshore lobster

waters, southern nearshore lobster waters and changes to the lobster and gillnet take reduction technology lists.

3.0 ALTERNATIVES

3.1 Preferred Alternative

The preferred alternative (PA) is a SAM program to protect predictable annual congregations of North Atlantic right whales in the waters off Cape Cod and out to the Exclusive Economic Zone line. NMFS would define two areas, called SAM West and SAM East, in which gear restrictions for lobster trap and anchored gillnet gear would be required. These proposed requirements would be more stringent than, and in addition to, the gear modifications currently required under the ALWTRP for the Offshore Lobster Waters, Northern Nearshore Lobster Waters, Northern Inshore Lobster Waters and Other Northeast Waters (gillnet area description). The time/area restrictions are based on the annual predictable presence of North Atlantic right whales as observed in aerial surveys from 1999-2001 (Merrick, et al. 2001). SAM West is proposed on an annual basis for the period March 1 - April 30. SAM East is proposed on an annual basis for the period May 1 - July 31. The dividing line between SAM West and SAM East is at the 69E 24' west longitude line.

3.2 No Action

The No Action alternative would leave in place the existing regulations promulgated under the ALWTRP.

3.3 Gear restrictions throughout the designated time frame

This alternative would implement one SAM zone comprised of the two separate SAM zones described in section 3.1 with gear restrictions required throughout the entire area during the designated time frame.

3.4 Gear restrictions lifted sequentially over time as right whale concentrations move through the area

This alternative would implement a single SAM zone based in the description in section 3.1 with gear restrictions initially required throughout the zone, but lifted sequentially over time as concentrations of right whales move across the zone from west to east.

3.5 No initial gear restrictions, but with restrictions put in place as right whale concentrations appear in the area and then lifted as right whale concentrations leave the area

This alternative would implement a single SAM zone based on the description in section 3.1 with no initial gear restrictions required until concentrations of right whales begin to appear in the area and then lifted as the animals leave the area.

4.0 AFFECTED ENVIRONMENT

The affected environment was discussed in detail in Section 6.0 of the EA published on July 15, 1997 (NMFS 1997). The physical area affected by this action are the waters off Cape Cod out to the Exclusive Economic Zone line and includes the northern edge of Georges Bank. The biological resources potentially affected by this action are also described in detail in of the EA published on July 15, 1997 (NMFS 1997), and updates are provided in Section 5.1 below. The main goal of the ALWTRP is to reduce serious injury and mortality of large whales. The proposed alternative was developed to accomplish that goal by reducing the threat of injury to large whales from entanglement in fixed fishing gear. Therefore, the general effect of this action to large whales (the primary marine resource affected by this action) should be beneficial.

4.1 STATUS OF THE LARGE WHALES

The status of the large whales is discussed in detail in Section 2.2 of the EA published on July 15, 1997 (NMFS 1997). The following is provided as an update of that section.

The information in this section is from the 2000 Marine Mammal Stock Assessments (Waring et al., 2000), and from entanglement reports compiled by NMFS between 1998 and 2001. The detailed reports for entanglements up to 1998 are contained in the 2000 SAR. Summaries of the 1998, 1999, 2000, and 2001 entanglements are provided below for each species. Additional information about the population biology and human-caused sources of mortalities and serious injuries is included in the 2000 Marine Mammal Stock Assessments which are available from NMFS and on an internet web page (www.nefsc.nmfs.gov/psb/assesspdfs.htm).

4.1.1 North Atlantic Right Whale

The North Atlantic right whale is the rarest of all large cetaceans and one of the most endangered species in the world. The western North Atlantic population is estimated at 291 animals (Kraus et al., 2000) and is unlikely to be significantly higher. A recent IWC workshop on the status and trends in this population (IWC, 2000) concluded that survival has declined. Due to the decline in survival, evidenced by the decline in calving rates and increase in calving interval, the PBR level for this population has been set to zero.

Approximately one-third of all known right whale mortality is caused by human activities (Kraus, 1990). Further, the small population size and low annual reproductive rate suggest that human sources of mortality may have a greater effect on population growth rates of the right whale than on those of other whales. The principal factors retarding growth of the population are believed to be ship strikes and entanglement in fishing gear (IWC, 2000).

For the period 1994 through 1998, the total human-caused mortality and serious injury to right whales is estimated as 1.4 incidents per year. Of this figure, 0.8 incident per year is attributed to entanglements and 0.6 to ship strikes. Note that some injuries or mortalities may go undetected, particularly those that occur offshore. Therefore, the estimates above should be considered minimum estimates.

In 1998, four right whales were reported entangled. On July 12, two right whales were found trapped in a weir near Grand Manan Island, Canada and were released 2 days later without apparent harm. Another right whale was seen entangled in rope of unidentified origin on August 15 near Mingan Island in the Gulf of St. Lawrence. The whale was too active to approach safely to disentangle it, and appeared to free itself of most of the gear.

One right whale was entangled twice (and actually disentangled three times) in Cape Cod Bay. The whale had been first seen entangled in 1997 in the Bay of Fundy. On July 24, 1998, the whale was seen near Dennis, Massachusetts (Cape Cod Bay), where most, but not all of the gear it had been carrying from the 1997 entanglement was removed. NMFS has not been able to identify the type of gear responsible for this 1997 entanglement. The same whale was seen again near Provincetown, Massachusetts, on September 12 with a lobster buoy line through its mouth, and the gear was removed. The same whale was seen again 2 days later (September 14) near Barnstable, Massachusetts, where it had picked up additional lobster gear which was also removed by the NMFS-supported disentanglement team. At last report, the whale was swimming freely but still had a thin line in its mouth from the 1997 entanglement, which is now believed to represent a serious injury to that animal as it may interfere with its ability to feed.

In 1999, six right whales were reported entangled. The gear was completely removed from one animal, and most of the gear was removed from two others. Although some gear was removed from a fourth animal, it ultimately died from the entanglement. The last two animals were sighted offshore (one in the US and one in Canada) but could not be relocated.

A total of five confirmed right whale entanglements were sighted in the Gulf of Maine (both in US and Canada) in 2000. One whale was completely disentangled, one whale was not a candidate for rescue due to its minor entanglement and one whale remained entangled and required further assessment. The disentanglement team was unable to respond to two entangled right whales. One is an unidentified right whale, sighted and lost by aerial survey in the Bay of Fundy, Canada. The other was sighted by aerial survey too far offshore on two occasions. This whale has been determined to have a minor entanglement.

In 2001, three right whale entanglements have been reported thus far. One whale, identified as #1102, was first sighted in the Great South Channel on June 8. The disentanglement team assessed that the whale was in grave condition due to the serious nature of the entanglement

and attached a telemetry buoy to track the movement of the whale. On June 26, the team attempted to disentangle the whale by first administering two doses of Midazolam, which the team hoped would sedate the whale and slow it down enough for the team to approach the head of the whale where the gear was lodged. However, the sedative did not produce the desired effect and the team had to further assess the condition of the whale for future disentanglement attempts. On July 14, the team made another trip out to the whale to attempt disentanglement. The whale was injected with the sedative twice, but, once again, the team noticed no effect on the whale and could not attempt disentanglement. On August 30, the whale was successfully sedated, however, the tail harness was not effective and therefore the disentanglement was not successful. A new tag was placed on the whale for continual monitoring. Unfortunately, on September 16, the transmission from the telemetry buoy stopped and the animal is believed to have succumbed to its injuries. On July 20, 2001, an unidentified entangled right whale was spotted 30 miles east of Portsmouth, NH, which the disentanglement team responded to and successfully disentangled. On November 3, 2001, the carcass of an adult male right whale identified as #1238 washed ashore on the Magdelen Islands, Quebec, Canada. The whale was extensively entangled in green polypropylene line and a necropsy was planned to determine the precise cause of death. Finally, during an Oil Pollution Patrol off the coast of Nova Scotia on December 3, 2001, by a Canadian Coast Guard plane, an unidentified female right whale carcass was located with no obvious sign of injury or entanglement in lines or fishing gear.

Details of these events are available from the Northeast Region contact or in the Protected Resources Division of Northeast Region website (www.wh.whoi.edu/ro/doc/nero.html).

4.1.2 Humpback Whale

The best estimate of abundance for humpback whales in the North Atlantic is 10,600 (Smith et al., 1998). The minimum population estimate for this stock is 10,019 (Waring et al., in prep). Within this population, the humpback whales in the Gulf of Maine constitute a distinct, relatively small, feeding stock. However, it is not genetically distinct from other sub-populations in the western North Atlantic, which are all treated as a single stock for the purposes of the Plan and the estimation of PBR. For purposes of the current stock assessment, the maximum net productivity rate for western North Atlantic humpback whales is assumed to be 0.065 (Barlow and Clapham, 1997). The PBR level for this stock is 32.6 humpback whales per year.

For the period 1994 through 1998, the total estimated human-caused mortality and serious injury to humpback whales in U.S. waters is estimated as 3.65 per year. This is derived from three components: (1) Entanglements that have been reported by NMFS observers equate to 0.25 per year, (2) additional fishery interaction records make up another 2.4 per year, and (3) vessel collision records which account for the remaining 1.0 per year

In 1998, twelve humpback whales were reported entangled. One whale died in gillnet gear off North Carolina before the fisherman could remove the gear, and another was found dead on the beach with clear evidence of entanglement on its flukes. The gear was completely removed from four animals, and most of the gear was removed from one other. Three animals were not resighted and two were involved in minimal entanglements for which no disentanglement attempt was deemed necessary.

Nine humpbacks were reported entangled in 1999. One whale was found dead on the beach with clear evidence of entanglement. Gear was completely removed from three animals and most of the gear was removed from another whale. The Canadian disentanglement team attempted to disentangle a humpback in the Bay of Fundy but was unsuccessful. No attempt was made to disentangle two animals as they were deemed to be minimal entanglements. One entangled humpback that was found while all disentanglement teams were involved in a right whale event, could not be relocated once the teams were free.

A total of eleven confirmed reports of entangled humpback whales were received in 2000. Three were not located by responders as no one was able to stand by. Two were too far to shore for response. Two were at large and not assessed. One was at large and was assessed as a not life threatening entanglement. Two were found and, although disentanglement was not possible, the animals were later seen free of gear. One was successfully disentangled by the Network.

In 2001, to date there have been a total of seven reports of entangled humpback whales - four in the Mid-Atlantic and three in the Northeast. On February 12, a juvenile humpback was sighted entangled in gillnet gear near Cape Hatteras, NC. However, after being caught in the gear for about an hour, the whale was able to free itself. On April 8, two humpbacks were reported stranded in South Carolina, both had evidence of previous entanglements with gear. On April 9, a dead juvenile humpback was found floating in coastal gillnet gear off Virginia Beach, VA. A humpback whale was reported in Southwest Stellwagen Bank on July 25, 2001, with a minor entanglement, which the team assessed was not life threatening and, therefore, disentanglement was not attempted, but the team will continue to monitor the whale. On August 15, 2001, another entangled humpback was sighted in Southwest Stellwagen Bank, which the disentanglement team responded to and completely freed. Finally, on September 23, 2001, the disentanglement team responded to and completely freed an entangled humpback on the Southwest corner of Stellwagen Bank.

Details of these events are available from the Northeast Region contact or in the Protected Resources Division of Northeast Region website (www.wh.whoi.edu/ro/doc/nero.html).

4.1.3 Fin Whale

The best available estimate of abundance for the western North Atlantic fin whale is 2,200, which is considered conservative (Waring

et al., in prep). The minimum population estimate is 1,803 (ibid.). For purposes of the current stock assessment, the maximum net productivity rate for fin whales is assumed to be 0.04. The PBR for this stock is 3.6.

Entanglements of fin whales are rarely documented. Because of the paucity of stranded animals or other records, NMFS has not calculated an average entanglement rate, although it believes that serious injuries or mortalities due to entanglements of fin whales occur at a rate below 10 percent of PBR. A review of 26 records of stranded or floating (dead or injured) fin whales for the period of 1992 through 1996 showed that three had formerly been entangled in fishing gear. Two of these had net or rope marks on the body, and one had line through the mouth and around the tail. Two fin whales were reported entangled in 1998; one was not resighted and the other was a floating carcass found off Digby, Nova Scotia, Canada with netting through the mouth and around the tail flukes. Three fin whales were reported entangled in 1999, all in Canada. Disentanglement attempts were made by the Canadian team on two; one was successfully disentangled, the other was not. The third animal was not resighted. There were no reports of entangled fin whales in 2000. In 2001, one fin whale has been reported with a minor entanglement, which is not serious and is likely to free itself.

4.1.4 Minke Whale

Minke whales off the eastern coast of the United States are considered to be part of the Canadian east coast population, which inhabits the area from the eastern half of Davis Strait south to the Gulf of Mexico. The best estimate of the population is 3,810 (Waring et al., in prep.), which is considered conservative. The minimum population estimate for Canadian east coast minke whales is 3,097 (ibid.). The current and maximum net productivity rates are not known, but the maximum rate is assumed to be 0.04. The PBR for this stock of minke whales is 31. Three minke whales were lost by the reporting vessels before Network response was made. One was successfully disentangled by the disentanglement team. In 2001, one entangled minke whale was reported off Cape Cod, which was determined to be minor.

5.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The biological resources potentially affected by this action are described in detail in the EA published on July 15, 1997 (NMFS, 1997). The main goal of the ALWTRP is to reduce serious injury and mortality of large whales. The 1994 Amendments to the MMPA provide a goal of reducing take in commercial fisheries to below PBR and also of reaching a ZMRG. For right whales, this provides the goal of eliminating serious injury or death resulting from incidental take in commercial fisheries. Under the ESA, NMFS must also ensure that any action the agency authorizes, such as commercial fishing for lobster, monkfish, multispecies and dogfish, does not jeopardize the continued existence of right whales. This proposed action was developed to facilitate reaching those goals by reducing the threat of injury to

right whales from entanglement in fixed fishing gear. Therefore, the general effect of this action to right whales (the primary marine resource affected by this action) is expected to be beneficial. Other marine mammals that are in a SAM area may benefit from the imposition of restrictions during the designated time period. Other species known to be affected by fixed gear are, of course, the fish species at which the gear is targeted. The environmental effects of the gear on targeted species are contained in the environmental documents for their FMPs. In addition, leatherback sea turtles are known to become entangled in lobster buoy lines. However, the entanglement mechanism is similar to what happens with large whales. Therefore, the environmental consequences of each alternative to leatherback turtles will be similar to that for large whales.

Lobster trap and gillnet fishermen who operate in the areas that are determined to be SAM zones would also be affected by this action.

5.1 PROPOSED ALTERNATIVE

The PA is a SAM program to protect predictable annual congregations of North Atlantic right whales in the waters off Cape Cod and out to the Exclusive Economic Area line. NMFS would define two areas, called SAM West and SAM East, in which gear restrictions for lobster trap and anchored gillnet gear would be required. These proposed requirements would be more stringent than, and in addition to, the gear modifications currently required under the ALWTRP for the Offshore Lobster Waters, Northern Nearshore Lobster Waters, Northern Inshore Lobster Waters and Other Northeast Waters (gillnet area description). The time/area restrictions are based on the annual predictable presence of North Atlantic right whales as observed in aerial surveys from 1999-2001 (Merrick, et al. 2001). SAM West is proposed on an annual basis for the period March 1 - April 30. SAM East is proposed on an annual basis for the period May 1 - July 31. The dividing line between SAM West and SAM East is at the 69E 24' west longitude line.

The interim final rule for SAM would implement a management scheme that restricts fishing with lobster trap and gillnet gear within the SAM areas to only modified gear that has been proven to prevent serious injury or mortality to North Atlantic right whales. This is achieved through the following means: (1) Identifying and delineating areas of seasonal concentrations of North Atlantic right whales; (2) reducing the amount of lobster trap and gillnet gear in the water column; and (3) requiring gear modifications that minimize the potential for serious injury or mortality of North Atlantic right whales in SAM areas.

NMFS is proposing to implement the approach identified in the RPA of restricting areas to modified gear that has been proven to prevent serious injury or mortality to North Atlantic right whales (rather than closing these areas to fishing gear). The first question that must be answered is what is meant by “proven.” It is not feasible, in the typical scientific fashion, to conduct and evaluate experiments on North Atlantic right whale interactions with modified gear. NMFS

cannot conduct laboratory or field trials on North Atlantic right whales to collect data. NMFS is able, however, to scrutinize past entanglements and learn from them ways to modify gear so that future serious entanglements do not occur. Since the issuance of the BOs, NMFS has conducted additional analysis of available data including that on the seasonal movement and congregations of right whales, previous entanglements, and the nature and position of gear in the water. Based on these analyses and our knowledge of North Atlantic right whale behavior, NMFS has identified gear modifications that are proven to prevent serious injury or mortality.

The first category of data that has been evaluated is past records of North Atlantic right whale entanglements that resulted in serious injury or mortalities to identify fishing gear that has been proven to result in serious injury or mortality. Utilizing entanglement data from 1999-2001, NMFS concluded that fishing line in the water column presents the highest entanglement risk from fishing gear to the North Atlantic right whale. NMFS examined these cases to determine the cause of the entanglement that resulted in serious injury or mortality and identified gear modifications that would prevent such injuries or mortalities in the future. These cases involved buoyline, floatline, endline and groundline. The proposed gear modifications include provisions to address each of these gear components that have been determined to be sources of entanglement.

Floating line has been identified as the root source of North Atlantic right whale entanglement because the line is designed to float in the water column to avoid contact with the bottom of the ocean during lower tides. The slack in the floating line is identified as a source of North Atlantic right whale entanglement. NMFS determined that typical offshore lobster pot gear is configured with approximately 7,000 ft (2,134 m)of floating line. Video recording of typical lobster gear with floating groundline between traps revealed that the line forms large loops in the water column between traps. Similar video recording of neutrally buoyant line between traps revealed that it did not have the same vertical profile as floating line; rather, it was located on or near the bottom and was not available to North Atlantic right whales as an entanglement risk. To minimize interactions between fishing gear and North Atlantic right whales, the proposed SAM rule would prohibit floating line for all lobster pot and gillnet gear within the SAM areas during the times specified. By eliminating floating line and requiring sinking or neutrally buoyant line, approximately 85 percent of the line within the water column would be eliminated.

Based on recent cooperative research between the NMFS Gear Research Team and an offshore lobster industry representative, NMFS estimates that outfitting an offshore lobster vessel with neutrally buoyant line would require approximately 50 nautical miles (nm) (80.5 km)of line. A typical changeover estimate to neutrally buoyant line from floating line for the northern inshore lobster fishery in the SAM area is on the order of 5 nautical miles of line per vessel. Preliminary estimates for the SAM East area suggest that 10 offshore lobster

vessels operate in the area with a limit of 1,800 traps per vessel. Forty five trawls of 40 traps each is the typical gear configuration for these 10 offshore lobster vessels. Each trawl uses up to 30 fathoms of groundline between each trap. The proposal to utilize neutrally buoyant and/or sinking line would remove as much as 600 nm (968 km) of floating line from the water column during the time when NMFS expects North Atlantic right whales to be in the area. A greater amount of floating line would be removed from the water column when one considers that the lobster and gillnet vessels in the SAM West area, as well as gillnet vessels in the SAM East area, would also be required to change over from floating to neutrally buoyant or sinking line.

Vertical line between the gear and the surface system is another source of entanglement. By allowing only a single buoy line per net string for gillnet gear and a single buoy line per trawl for lobster trap gear, the amount of vertical line in the water column is further reduced by 50 percent. It is not technologically feasible at this time to remove all vertical lines from the water column, since there has to be some way for fishermen to haul a line at the surface to bring up gear from the sea floor.

The 85-percent reduction in floating line and 50-percent reduction in vertical line are methods that prevent serious injury or mortality to North Atlantic right whales. If the line is not within the water column the threat of entanglements from these gear components is eliminated.

The measures proposed result in a significant reduction in the volume of line in the water column in SAM areas. However, line still remains at the one buoy line for both lobster and gillnet gear and in the panels of gillnet gear. The amount of line in the buoy line that is vertical in the water column would be reduced significantly by the proposed prohibition on the use of floating line. To further reduce the risk posed by remaining vertical line, weak links at reduced breaking strengths are proposed as a requirement of the modified gear.

Past entanglements provide evidence that weak links are a critical measure to prevent serious injury or mortality of marine mammals. The proposed placement of the weak links is designed to provide key breaking points so that any North Atlantic right whale that does become entangled would be able to break free (by breaking a weak link) prior to any serious injury or mortality. For gillnet gear set in the SAM areas, each net panel would be required to have a total of 5 weak links with a maximum breaking strength of 1,100 lbs (498.9 kg). One floatline weak link would be required to be placed at the center of the net panel and two weak links would be placed as close as possible to each of the bridle ends of the net panel. The remaining two weak links would be placed in the center of each of the up and down lines at either end of each panel. In addition, all anchored gillnets are required to be securely anchored with the holding power of at least a 22 lb (9.9 kg) Danforth-style anchor at each end of the net string. Serious injuries and mortalities have occurred when North Atlantic

right whales became wrapped in gear. When a North Atlantic right whale encounters gear that does not have weak links and is not properly anchored then any effort by the whale to free itself of the gear likely results in it becoming further and further wrapped up in the gear. Anchoring provides tension so that, when a whale encounters the anchored gear, sufficient tension is placed on the line, which is then likely to break at the weak links resulting in the whale either entirely breaking free of the gear or swimming away with a line or portion of gear rather than being wrapped in the gear. When the gear is attached to the whale in this manner, rather than being wrapped around the whale, it can be shed by the whale or may be removed through disentanglement efforts, and serious injury or mortality may be avoided.

In order to evaluate the effectiveness of weak links placed in the float line of gillnets, NMFS conducted investigations simulating an entanglement. NMFS placed strain on fifteen net strings that were anchored and twenty that were not anchored. Trials were run with both 600 lb (272.2 kg) and 1,100 lb (498.9 kg) weak links at three places on the floatline. When strain was applied to the gillnets with proper anchoring systems, the floatline weak line broke with very little net attached. This provides evidence that the weak links can be expected to break when encountering strain such as that placed on it by a marine mammal. The fact that the weak link broke quickly and cleanly provides evidence that an encounter between a North Atlantic right whale and gillnet gear with proper anchoring and the five proposed weak links would be highly unlikely to result in the serious injury or mortality of that North Atlantic right whale. It is also important to note that recently a float has been designed and developed that incorporates a weak link allowing fishermen to place weak links in gillnet gear much more easily.

A study was conducted in 1997 by the Department of Fisheries, University of Rhode Island, to estimate the tractive force for the North Atlantic Right Whale. Maximum propulsive force (forward moving burst force) estimates for the North Atlantic right whale ranged from 465 lbs (210.9 kg) for 13 foot (3.9 m) whales to 9,440 lb (4,281.9 kg) for 59 foot whales. Maximum estimates of tractive forces for right whales ranged from 135 lb (61.2 kg) for 13 foot (3.9 m) whales to 6,969 lb (3,161 kg) for 59 foot (17.9 m) whales. Data on objects towed by right whales during rescue operations was also analyzed to determine forces capable of being generated by right whales. During the disentanglement of a 43 foot (13.1 m), 38.6 ton right whale, the Center for Coastal Studies attempted to fatigue the whale by adding an 8 foot (2.4 m) sea anchor, 5 Norwegian balls, and an inflatable boat. A 42 foot (12.8 m) fishing vessel was also tied to the whale. The vessel and gear were towed by the whale for one hour at a speed of 9 knots. The total estimated drag on the whale during this operation ranged from 593 lb to 2,369 lb (268.9 kg to 1,074.6 kg). In addition, during the rescue the whale parted a rope with an estimated breaking strength of 400 lb (181.44 kg). The size of animals in the Bay of Fundy are likely to reflect the size of animals that pass through SAM. Seventy-seven animals observed and measured in the Bay of Fundy in

2000 and 2001 ranged in size between 25 to 50 feet (7.5 to 15 m). Of these seventy-seven animals, 86 percent were greater than 33 feet (10 m). Based on this information, it would appear that most right whales in the SAM area would be able to exert enough force on the 1,100 weak links to break them and thus become free of the gear.

In July 2001, a North Atlantic right whale was observed entangled in offshore lobster gear. The gear investigation determined that the entanglement was in the surface system (consisting of the buoy(s) and high flyer). Weak links were required in the portions of the gear where the entanglement occurred and, based on the gear remaining in the water and that was removed from the whale during disentanglement, it was determined that the weak link had functioned properly and had released the whale from the lobster pots. Based on the gear investigation, it was determined that the weak link allowed the North Atlantic right whale to break away from the majority of the offshore lobster gear, ending up with only a small piece of the line. The whale was completely disentangled by the Center for Coastal Studies without any serious injury or mortality. Based on weak link studies and reviews of gear configurations involved in entanglements, NMFS concludes that the additional weak links and lower breaking strengths in the surface system proposed in the SAM regulations would have likely allowed the North Atlantic right whale to free itself of all gear.

NMFS proposed to require the installation of weak links with a maximum breaking strength of 3,780 lb in the offshore lobster trap and anchored gillnet gear between the surface system (all surface buoys, the high flyer, and associated lines) and the buoy line leading down to the trawl and gillnet, respectively. This proposed measure was the result of analysis conducted by NMFS from a successful disentanglement of a 7-year-old male North Atlantic right whale, catalog #2427, on July 20, 2001. NMFS' analysis concluded that the gear recovered during the disengagement and the description of the owner's typical gear configuration indicated that the surface system was separated from the buoy line going to the trawl by a weak link with a breaking strength of 3,780 lb. It was felt that the presence and location of this weak link in the gear may have prevented the animal from becoming further entangled in the buoy line.

However, since the publication of this proposed measure, NMFS technical experts have re-evaluated this proposed measure. Although in theory the proposed measure would add an extra level of protection to potentially prevent the risk of serious injury to North Atlantic right whales should they become entangled in the buoy line, this measure is not practical from a mechanical standpoint. Operationally, having any weak link below the float system will essentially be ineffective. In order to break, a link would need to have adequate resistance from the relevant end of the gear. Given that any whale that is caught below the link would be pulling against nothing more than the surface system and the buoy, one cannot reasonably conclude that the resistance involved would be sufficient to trigger the break of the weak link. Therefore, NMFS has reconsidered this measure and

is not requiring the use of weak links between the surface system and the buoy line for the offshore lobster trap and anchored gillnet gear within the SAM areas.

The concept of removing floating line from groundlines and buoy lines and the increased use of weak links was supported in discussions with the ALWTRT at its June 27-28, 2001 meeting and in public comments received on the SAM ANPR. The ALWTRT membership includes environmental interests, fishermen, gear experts, state and federal fisheries managers and large whale biologists who are considered experts in their respective fields. This group, as evidenced by the extensive development of additional gear modifications at the June 27-28, 2001, ALWTRT meeting, generally supports gear modifications as an element of SAM. NMFS believes that this interim final rule provides significant conservation benefits to North Atlantic right whales and that these measures, as a component of the RPA, remove jeopardy for the North Atlantic right whale.

Level II or Low Risk Gear is proposed as a requirement within a SAM area. A definition developed by a subgroup of the ALWTRT states that Level II or Low Risk Gear is gear for which any entanglement would be minor, meaning where death or serious injury is highly unlikely. NMFS is proposing that the gear listed below be required to fish in SAM areas during the specified times.

The information and analysis provided in this document demonstrates that the gear modifications proposed for SAM areas (including replacing floating line with neutrally buoyant line, additional weak links, reduced breaking strengths for weak links and limits on the number of buoy lines) are proven to prevent serious injury or mortality to North Atlantic right whales. The proposed SAM measures would, therefore, implement the SAM portion of the RPA as described in the June 14, 2001, BOs.

5.1.1 Biological Impacts

SAM reduces the risk of entanglement to right whales by implementing seasonal limits on fishing operations in certain areas based on predictable annual congregations of right whales. SAM was identified in the BOs for the lobster, dogfish, monkfish, and multispecies fisheries as a component of the strategy necessary to avoid jeopardy to right whales. The SAM program was designed to provide critically endangered North Atlantic right whales protection from serious injury and mortality from entanglements with fishing gear used in those fisheries.

The NEFSC examined 1,307 right whale observations in 784 different sightings during three years of aerial surveys between March-July 1999-2001 to determine areas with predictable annual concentrations of right whales that should be considered for SAM. Sightings in March-April tended to be in the area surrounding Cape Cod (e.g. Provincetown

Slope). However, by May, right whales were regularly sighted along the northern edge of Georges Bank and in the Great South Channel. During all three years, right whales were consistently seen in this area and into Wilkinson Basin through June, with some sightings farther to the north as the season progressed. During 1999-2000, concentrations of right whales were found episodically in the Cashes Ledge area - specifically in April 1999, and June 2000. Similar concentrations in the Cashes Ledge area were not found in 2001.

NEFSC reviewed sightings from every survey day during 1999-2001 to identify events sufficient to trigger a Dynamic Area Management (DAM) closure. The trigger used was a sighting of three or more right whales sufficiently close to one another to achieve a density of 0.04 right whales/nm^2 (Clapham and Pace 2001). Concentrations of right whales that would have met the triggering criterion (events) occurred 149 times during 1999-2001, with events peaking in May and June. Core areas were mapped by defining a circle around the center of the event, which was then expanded with a 15 nm buffer zone to account for animal movements (Clapham and Pace 2001). SAM zones were mapped for each analysis year (1999-2001) by drawing a simple polygon around each buffer area, which produced three annual sets of SAM zones (Merrick, et al. 2001).

An area was considered to be a candidate for SAM if right whales were observed in the area during spring in all three years (Merrick, et al. 2001). Comparing SAM zones from the 3 years of surveys revealed a consistent pattern in habitat use in areas outside of the Great South Channel and Cape Cod Bay (Ibid). Right whales were consistently seen in all 3 years in the area from Cape Cod eastward to the Hague Line, but only sporatically seen to the north (e.g. the Cashes Ledge area)(Ibid). A composite SAM zone was created from the three annual SAMs, which includes almost all of the right whale sightings from 1999-2001. Further data analysis and realignment of the SAM boundaries based on existing management zones in the Gulf of Maine suggested that SAM should be divided into two smaller SAM zones. The first is a core area of about 7,000 nm^2, extending from Cape Cod eastward to the Hague Line, with a consistent pattern of right whale sightings over all three survey years. The second is a northern zone of about 1,700 nm^2, which covered additional right whale sightings that occurred sporadically in some months during 2 of the 3 survey years.

NMFS decided to proceed with proposing management measures for within the core SAM zone only because of the lack of consistent sightings in the northern zone and the uncertainty regarding the potential benefits to right whales from implementing management measures in that area. In addition, only 15 of the 149 events during 1999-2001, occurred outside the core SAM area, Great South Channel, and Cape Cod Bay. NMFS determined that, within the core SAM zone, right whales were more likely to be seen in the western part of the area (near Cape Cod Bay and Great South Channel) in March-April than in May-July. This information suggests that there is a east-west division in the

seasonal distribution of right whales within the core SAM zone at 69E 24'W longitude. Therefore, NMFS divided the core SAM zone into two areas, called SAM West and SAM East. SAM West is proposed on an annual basis for the period March 1 - April 30. SAM East is proposed on an annual basis for the period May 1 - July 31.

5.1.2 Economic Impacts of the Proposed Action

Under the PA plan vessels fishing lobster or sink gillnet gear must modify their gear to continue fishing in the area identified as SAM East (May 1 to July 31) and SAM West (March 1 to April 30). Several potential scenarios exist as to how the fishing industry may adapt to this proposed action. The scenarios include: 1) convert to low risk gear and continue fishing in SAM; 2) choose not to fish or convert to low risk gear; or 3) fish outside of the SAM area, do not convert to low risk gear, and move gear back into SAM when it reopens.

In scenario 1, vessel profits or revenues will be reduced as a result of incurring the cost of converting to low risk gear. Under scenario 2, vessels will incur the cost of removing and resetting their gear in SAM when it opens, plus forgone revenues from not fishing. Under scenario 3, a vessel may increase or decrease their revenue depending on the catch rates outside of SAM. For example, if the catch rates are greater outside of SAM, we expect there to be revenue gains. It is more likely that vessels fish in areas that maximize their profits and therefore catch rates would be equal or less outside of SAM. In scenario 3, the vessel will incur the differences in revenue between fishing inside and outside of SAM, plus the cost of removing their gear from SAM and then resetting it back in SAM when it opens. In the last two scenarios, vessels take on the risk of losing their fishing territory in SAM to another vessel.

The economic analysis of the PA is divided into three sections. Section 5.1.2.1 and 5.1.2.2 investigates the consequences of scenario 1 for the lobster and sink gillnet fleet, respectively. The results of the first two sections under scenario 1 are then summarized in Section 5.1.2.3. This summary section then ends with a discussion of scenario 2 and 3 as identified above.

5.1.2.1 Lobster Fleet

In this section we present the economic impacts of SAM East and SAM West on the lobster fleet. To continue fishing in these areas a vessel must convert to low risk gear. Vessels fishing in SAM East are large offshore vessels with lengths greater than 50 feet. In contrast, smaller vessels are primarily fishing in SAM West. We start this section by presenting the method of a break even analysis. The break even analysis is used to determine whether a vessel can incur these gear conversion costs and continue to fish and earn profits. Next we estimate the material and labor cost of converting to low risk gear for the average vessel. The economic impact of SAM East on the

lobster fleet is evaluated next. This includes estimating the number of vessels fishing in the area, revenues earned per vessel, annual variable and fixed vessel expenses and we end with a break even analysis results. Once the analysis of SAM East is complete, SAM West is analyzed with the same components.

Method of Break-Even Analysis

In a break even analysis, the break even quantity identifies how many pounds of lobster a vessel must land before the vessel begins to earn profits. A break even analysis takes into consideration the price per pound of lobster received at the dock (P), the variable cost per pound of lobster (VC) and total fixed costs the vessels incurs within a year (FC). Formally the break even quantity Q_{BE} equation is:

$$Q_{BE} = \frac{FC}{P - VC}$$

Total fixed costs were based on the lobster vessel survey data by Gates (1995). The price per pound of lobster is calculated from recorded landings in the 2000 Dealer data. Finally, the variable cost per unit is equal to total variable expenses (Gates, 1995) divided by annual lobster landings per vessel.

The approach is to first examine the break even quantity without the proposed action. Next the lower bound cost of converting the existing gear to low risk gear is added to the fixed expenses, and the break even quantity is recalculated. The break even quantity is calculated once more using the upper bound cost of the gear conversion. Finally, we examine how the profitability and the break even quantity for an average vessel is altered under the proposed action, and then determine whether the vessel can absorb these extra costs.

Gear Conversion Costs

Low risk lobster gear requires: 1) the use of neutrally buoyant line on all ground and buoy lines; 2) only 1 buoy line; 3) a weak link (WL) with a breaking strength of 1500 pounds on the high flyer and the buoy ball; and 4) a weak link with a breaking strength of 3780 pounds just below the water surface[1].

Data

The following data sources were used: 1) Bisack (2000) estimates lower and upper bound numbers of lobster traps fished by area; 2) the NEFSC Gear Specialist (NMFS, *pers. comm.*) provided unit material costs for the gear and labor time required to convert to low risk gear; and 3) the U.S. Bureau of Labor Statistics provided hourly manufacturing labor rates as a labor rate for modifying gear. Data used in this analysis can be found in Table 5.1.2.1.

[1]The weak link with a breaking strength 3780 lbs is no additional cost item since it was already required in the October 2000 Gear EA (NMFS, 2000).

Data from the 2000 NEFSC Vessel Trip Reporting (VTR) logbook system were used to estimate the number of traps fished, which is considered a lower bound (Bisack, 2000). The VTR logbook has recorded fishing activity at the fishing trip level. An upper bound estimate would be the number of traps legally allowed. Vessels effected by SAM will be those fishing in the northern nearshore and northern offshore management areas. Vessels that fish offshore exclusively are allowed to fish 1800 traps and all other vessels have a maximum of 800 traps. Trawls are fished, where a trawl consists of several traps tied together on one line. We assume vessels in the nearshore area fish 15 traps per trawl, and offshore vessels fish 40 traps per trawl.

The lower and upper bound estimate of trawls fished by northern nearshore vessels is 17.7 and 53.3, respectively (Bisack, 2000).[2] The lower and upper bound estimate of trawls fished by northern offshore vessels is 21.4 and 45 trawls, respectively.

All ground and buoy lines must be replaced with neutrally buoyant or sinking line. We assume vessels will use neutrally buoyant line over sinking line since it costs less per foot. Vessels fishing in offshore waters use line that is 5/8" in diameter and made of polypropylene.[3] The cost of neutrally buoyant line is $0.211 per foot, versus $0.28 per foot for sinking line. Vessels in the nearshore or inshore area use 3/8" line at a cost of $0.06 per foot of neutrally buoyant line.

There are two choices available for a weak link with a breaking strength of 1500 pounds. One weak link choice is 1/4" polyester at $0.073 for 3 feet. Alternatively, one may choose a plastic swivel at a unit cost of $2.50.

Total gear conversion costs include materials and labor. According to the U.S. Bureau of Labor, a manufacturing position earns $14.05 per hour. We assume it takes 2 minutes of labor to measure out 100 feet of line (TTM), and 10 minutes to attach a weak link (TAWL).

Method to estimate the cost to convert to low risk gear
Gear conversion costs include the material and labor for replacing all ground and buoy lines with neutrally buoyant line and attaching two 1500 lb breaking strength weak links. We assume vessels will choose neutrally buoyant line over sinking line since it is currently sold at

---

[2] Lobster vessels are divided into 3 length classes. Class I are vessels less than 35 feet, Class II are vessels between 36 and 49 feet, and Class III vessels are greater than 49 feet. Class I and Class II vessels fish primarily in northern nearshore vessels and Class III vessels primarily fish in northern offshore waters.

[3] The cost of 5/8" polypropylene is approximately 13.5 cents a foot.

a lower cost. In addition, neutrally buoyant line may have a longer life since it lies on the surface of the bottom and the fibers of the line will absorb less sediment compared to sinking line which lies beneath the bottom surface. There should be less wear on neutrally buoyant line operationally.
A general method is presented here on how to calculate the material and labor costs of these 3 gear conversions.

Material and labor cost of ground lines
Material cost of ground lines (MC(GL)) is the product of the number of trawls (NTR), number of traps (NT), the length of line between traps (LLBT) and the dollar price per unit ($/unit). Labor cost of the ground lines (LC(GL)) is the product of the number of trawls (NTR), number of traps (NT), length of line between traps (LLBT), the time to measure 100 feet of line (TTM), and the hourly labor rate ($LR). In equation form we have:

$$MC(GL) = NTR * (NT * LLBT * \$ / unit)$$
$$LC(GL) = NTR * (NT * LLBT * (TTM / 60 minutes / 100 feet) * \$LR)$$

Material and labor cost of buoy lines
Material cost of buoy lines (MC(BL)) is the product of the number of trawls (NTR), the depth of the water (DOW), slack for tides (Slack=1.5), and the dollar price per unit ($/unit). Labor cost of the buoy lines (LC(BL)) is the product of the number of trawls (NTR), the depth of water times the slack, the time to measure 100 feet of line (TTM), and the hourly labor rate ($LR). In equation form we have:

$$MC(BL) = NTR * DOW * Slack * \$ / unit)$$
$$LC(BL) = NTR * (DOW * Slack * (TTM / 60 minutes / 100 feet) * \$LR)$$

Material and labor cost of weak links
The material cost of two weak links (MC(WL)) is the product of the number of trawls (NTR), two weak links (WL), and the dollar price per unit ($/unit). We multiply the material cost by 50 percent since we assume vessels will use plastic swivels on half the gear and a ROABS on the remaining gear. Therefore the total material cost is the sum of the cost of plastic swivels and ROABS. Labor cost of the weak links (LC(WL)) is the product of the number of trawls (NTR), two weak links (WL), the time to attach a weak link (TAWL), and the hourly labor rate ($LR).[4] In equation form we have:

$$MC(WL) = NTR * 2\ WL * \$ / unit) * 0.5 \text{ of the gear}$$
$$LC(WL) = NTR * (2\ WL * (TAWL / 60 minutes) * \$LR)$$

[4] Each lobster trawl typically has one buoy line at the end of each trawl. We assume a vessel will detach one buoy line within normal fishing operations at no cost.

Cost to convert to low risk gear
The lower and upper bound cost per vessel to convert to low risk gear in the northern nearshore area is $2,493 and $7,508, respectively (Table 5.1.2.2). In the northern offshore area, the lower and upper bound cost per vessel is $36,285 and $76,298, respectively. The largest cost component is the material cost of replacing existing ground lines with neutrally buoyant line. In the northern nearshore area material cost of neutrally buoyant ground line is 77 percent of the total cost and it consumes 90 percent of the total cost for the northern offshore vessels.

We assume a vessel will take a 3 year business loan to pay for the up-front material and labor costs of converting to low risk gear.[5] Interest rates for short term business loans range between 6 percent and 11 percent depending on an individual's credit history. An average of 8.5 percent was used here. For a vessel fishing in the nearshore area, the lower bound gear conversion cost is $2,493 (Table 5.1.2.2), and annual payments are $944 with a total loan payment of $2,833. With the upper bound cost of $7,508, annual payments are $2,843 with a total loan payment of $8,530. For a vessel fishing in the offshore area, the lower bound gear conversion cost is $36,285, and annual payments are $13,745 with a total loan payment of $41,234. With the upper bound gear conversion cost of $76,298, annual payments are $28,902 with a total loan payment of $86,707.

SAM East
Estimate of the number of vessels
The lower and upper bound estimate of vessels fishing in SAM East is 4 and 7, respectively. To develop the lower bound estimate, data from NEFSC's 2000 Vessel Trip Report (VTR) logbook, and 2000 catch data from the state of Massachusetts were used. According to the VTR, 94 vessels were fishing primarily in the northern offshore area during this time period (May 1 - July 31, 2000). Of these 94 northern offshore vessels, 4.3 percent (0.043 =4/94) of the vessels fish in SAM East. To start, there were 10 vessels showing activity in SAM East. Three vessels were eliminated since 90 percent or more of their trips occurred in other management areas (northern inshore, northern nearshore and Cape Cod Bay). We assume these vessels will redirect their fishing effort from SAM to the other fishing areas and incur some minimum cost. According to the VTR, lobster vessels less than 50 feet travel an average maximum distance of 34 nautical miles from port

[5] The shelf life of neutrally buoyant line is unknown. Typically ground and buoy lines made of polypropylene are replaced every 6 years on average (NMFS, *pers. comm.*). The neutrally buoyant line may have a shorter life since the fibers of the rope will be in contact with the sediment more compared to the existing polypropylene line. We assume a vessel would not want to have a loan payment for a product that is longer the life of the product. We therefore chose 3 years as the term length of the loan.

(CV=1.03) and vessels 50 feet and longer travel an average maximum of 112 nautical miles from their port of landing (Bisack DAM, 2000). The west boundary of SAM East is at least 35 nautical miles from the east shore of Cape Cod, Massachusetts. Three vessels fishing in SAM East were less than 50 feet in length and were therefore eliminated from the sample of vessels fishing in SAM East. Finally, the lower bound estimate of vessels fishing in SAM East is 4.

The upper bound estimate of vessels fishing in SAM East is 7. Using Bisack (2000) approximately 172 vessels potentially fish in the northern offshore area. This estimate includes vessels with recorded fishing activity and those that hold permits without recorded fishing activity. According to the VTR, 4.3 percent of the vessels in the northern offshore area fish in SAM East from May 1 to July 31, 2000. Therefore, the upper bound estimate of vessels fishing in SAM East is 7 (7.4 = 172*0.043).[6] For this analysis we will assume the number of vessels fishing in SAM East is 7 vessels. That is, we do not estimate industry costs based on the lower bound estimate of 4 vessels.

Vessels are divided into three classes based on length. Class I includes vessels of length 35 feet or less, Class II vessels are between 35 and 49 feet, and Class III are vessels of length 50 feet or greater.

Revenues
According to the 2000 VTR for four Class III lobster vessels, annual revenue and lobster landings per vessel were $770,000 (CV=0.21) and 173,400 pounds (CV=0.21), respectively. In SAM east, average revenue and landings per vessel during this time period were $166.4K (CV=0.53) and 34,600 pounds of lobster (CV=0.52), respectively.

Variable and Fixed Vessel Expenses
Cost survey data from the University of Rhode Island were used to estimate an offshore vessel's variable and fixed expenses (Gates, 1995). These data collected in 1995 were adjusted using a producer price index to the year 2000. Variable expenses include boat repairs, supplies, food, gear maintenance, fuel, bait and labor cost of the crew and captain. Fixed expenses include the cost of licenses, mooring and dock fees, interest and principal on loans, and insurance.

Based on Gates (1995) and applying a producer price index, variable expenses are $352,047 and fixed expenses are $75,930 a year for a vessel fishing lobster traps in the offshore area (Table 5.1.2.3).

Results of Break Even analysis of the PA within SAM East.
The breakeven quantity for a vessel that was fishing in SAM East

[6] A representative of the northern offshore lobster fleet identified 7 vessels fishing in SAM East (pers. comm. with Offshore Lobster Industry Representative).

without this proposed regulation is 38,556 pounds of lobster, which is 22 percent of their annual landings. Vessels that fished in SAM East in 2000 landed 34,600 pounds of lobster. The break even analysis is based on an annual time frame. Given a vessel incurs the lower or upper bound cost of gear conversions, their break even quantity would increase by 18 percent and 38 percent, respectively.

Annual profits per vessel are $342,072 (Table 5.1.2.4). Given an offshore vessel incurred the lower or upper bound cost of converting to low risk gear, annual profits would be expected to be reduced by 4.0 percent and 8.5 percent, respectively.

Finally, it appears that the cost a vessel will incur to convert to low risk gear will allow the vessel to continue to fish and earn profits. Under the upper bound gear conversion cost, the break even quantity for an offshore vessel is 31.0 percent of annual lobster landings, compared to 22 percent without the proposed regulation. Given profits are reduced by a potential maximum of 8.5 percent, this loss may outweigh the territorial nature of the fishery. That is, it may very well be worth this decrease in profits to maintain a fixed position on the bottom for catching lobsters. If a vessel chooses not to convert to low risk gear, they may risk the loss of fishing territory to another vessel once the area opens to all fishing.

SAM West

Estimate of the number of vessels

The lower and upper bound estimate of vessels fishing in SAM West from March 1 to April 30 is 8 and 11, respectively. Data from NEFSC's 2000 Vessel Trip Report (VTR) logbook and 2000 catch data from the state of Massachusetts were used. According to these data, 631 vessels had recorded fishing the northern nearshore and offshore management areas. SAM West falls within these two management areas. Of these 631 vessels, 1.3 percent (8 vessels) had recorded fishing activity in SAM West.

The upper bound estimate of vessels fishing in SAM West is 11 vessels. Using Bisack (2000) approximately 172 vessels potentially fish in the northern offshore area and 677 vessels potentially fish in the northern nearshore area. According to the VTR, approximately 1.3 percent of the vessels fish in SAM West. Therefore, the upper bound estimate of vessels fishing in SAM West is 11 (=0.013*(172+677)). For this analysis we will assume the number of vessels fishing in SAM West is 22 from March 1 to April 30.

Sixty three percent of the vessels (5 vessels) were Class I and the remaining 37 percent were in Class III.[7] Although these larger vessels

[7] Information can only be reported for 3 or more vessels. There was one vessel in Class II at 48 feet, and 2 vessels in Class III. To allow reporting the 48 foot vessel was included with the 2 vessels in

have the capability of fishing offshore exclusively, their fishing records show activity in the nearshore and offshore areas. Lobster Management Area (LMA)1 and the Off Cape Area (OCA) are a subset of the nearshore area. These vessels had fishing activity in LMA 1, OCA and offshore (LMA 3). Therefore, all 8 vessels in length Class I and III, are allowed a legal maximum of 800 traps. Vessels fishing in this area fish 15 traps per trawl. Using Bisack (2000), the lower and upper bound estimate of the number of trawls fished are 17.7 and 53.3, respectively (Table 5.1.2.1).

Revenues
According to the 2000 VTR and catch data from the state of Massachusetts, Class I vessels fished 61.2 trips (CV=0.68), earned $28,400 (CV=0.81) in revenues and landed 7,100 pounds of lobster per year. In contrast, Class III vessels fished 83.5 trips (CV=0.25), earned $323,900 in revenues by landings 75,300 pounds of lobster per year.

In SAM West, the Class I lobster vessels earned average revenues of $267 (CV=0.81) and landed 216 (CV=0.81) pounds of lobster per vessel. Revenue and lobster landings in SAM West for Class III vessels were $7,485 (CV=1.50) and 892 pounds of lobster, respectively.

Variable and Fixed Vessel Expenses
In Gates' analysis (1995), Class I vessels were 33 feet in length and fished 159 days per year on average. According to the VTR, there were 5 Class I vessels fishing in SAM West that fished 61.2 days (CV=0.68) per year. Variable expenses and some fixed expenses such as insurance, interest and loans and property taxes were prorated from 159 days to 61.2 days.[8] A 2000 producer price index was then applied to the 1995 prorated cost estimates. Finally, annual variable expenses for Class I vessels are $13,540 and annual fixed expenses are $9,042, for a total of $22,582 (Table 5.1.2.5).

In Gates' analysis (1995), Class III vessels had an average length of 72 feet and fished 216 day per year on average. According to the VTR, the three Class III vessels fishing in SAM West, were 63 feet in length and fished 103.4 day per year on average. Annual variable and

---

Class III. The average length of all 3 vessels was 63 feet.

[8] Based on the annual days at sea, these vessels appear to be part-time versus full-time fishing vessels. Variable and some fixed expenses are therefore scaled according to their time at sea, since we would not expect a part-time fisher to be as invested in fixed costs such as property taxes compared to a full-time fishing vessel.

fixed vessel expenses were prorated from 216 days to 103.4 days.[9] In 2000, annual variable expenses for these Class III vessels were $168,527 and annual fixed expenses were $38,710 for a total of $207,237 (Table 5.1.2.6). These vessels typically fish with 2 to 3 crew members including the captain.

Results of a Break Even analysis of the PA within SAM West

Class I lobster vessels

Without the proposed alternative, Class I lobster vessels have a break even quantity of landing 4,320 pounds of lobster, which is 61 percent of their annual landings (Table 5.1.2.7). That is, they start to earn a profit when they land more than 4,320 pounds. Given their break even quantity is much greater than the amount they landed in SAM West in March and April (67 pounds of lobster), there business decisions are based on an annual time frame versus a seasonal time frame. The break even quantity increases by 10 percent and 31 percent for the lower and upper bound gear conversion cost. At the upper bound, the break even quantity is 80 percent of annual landings, compared to 61 percent without the regulation.

These length Class I vessels earn annual profits of $5,818 and land 7,100 pounds of lobster per year on average (Table 5.1.2.7). If a Class I lobster vessel incurred the lower or upper bound cost of converting to low risk gear, annual profits would decrease by 16 percent and 49 percent, respectively. The annual payment of the lower bound gear conversion cost ($2,833) (Table 5.1.2.16) is greater than revenues earned in SAM West ($267) per vessel. Based on this analysis, it would not be cost effective for Class I SAM West lobster vessels to convert to low risk gear.

Class III lobster vessels

Without the proposed alternative, Class III vessels have a break even quantity of landing 21,970 pounds of lobster, which is 29 percent of their annual landings (Table 5.1.2.8). Given their break even quantity is much greater than the amount they landed in SAM West in March and April (900 pounds of lobster), these vessels also make business decisions based on an annual time frame versus a seasonal time frame. The break even quantity would increase by 2.4 percent and 7.3 percent for the lower and upper bound gear conversion cost. At the upper bound, the break even quantity is 31 percent of annual landings, compared to 29 percent without the regulation.

Vessels earned annual profits of $116,463 and land 75,300 pounds of lobster per year on average (Table 5.1.2.8). If a Class III vessel incurred the lower and upper bound cost of converting to low risk gear, annual profits would decrease by 12 percent and 25 percent,

[9] A scale adjustment for variable and some fixed costs are also made for these Class III vessels, as applied above with the Class I lobster vessels.

respectively. This profit reduction is based on a one year versus 3 year term loan payment. If vessels incur the upper bound cost of converting their gear they may continue to fish and earn profits.

5.1.2.2 Sink Gillnet Fleet

In this section we present the economic impacts of SAM East and SAM West on the sink gillnet fleet. To continue fishing in these areas a vessel must convert to low risk gear. We start this section by presenting a method to determine a vessel's profits. We then estimate how much profits will change under this regulation. The change in profits under this regulation is a function of the material and labor cost of converting to low risk gear for the average vessel, which is presented next. The economic impact of SAM East on the sink gillnet fleet follows. This includes estimating the number of vessels fishing in the area, revenues earned per vessel, annual variable and fixed vessel expenses and we end with the results of a vessel profit analysis. Once the analysis of SAM East is complete, SAM West is analyzed with the same components.

Method of estimating vessel profits

Vessel profits depend on the layman system which is used. In the sink gillnet fishery, the layman's system removes trip operating costs from trip revenues. Then 50 percent of the remaining revenues are paid to the captain and crew for labor. The split between members on the vessel depends on level of experience. The remaining revenues are paid to the boat. This system will be used to estimate vessel profits. Annual profits are equal to annual revenues minus variable and fixed expenses, and times fifty percent. Next we determine whether a vessel can absorb the cost of converting to low risk gear, by evaluating the change in profits as a result of this regulation.

Gear Conversion Costs

Whale safe sink gillnet gear requires: 1) the use of neutrally buoyant or sinking line on all ground, buoy and anchor lines; 2) only 1 buoy line; 3) a weak link (WL) with a breaking strength of 1100 pounds on the high flyer and the buoy ball; 4) 5 weak links of 1100 lb breaking strength on each net panel; 5) a weak link with a breaking strength of 3780 pounds just below the water surface, and 6) an anchor with holding power of a 22 pound danforth anchor or greater at the end of each sink gillnet string.

Data

The following data sources were used: 1) Bisack (2000) provides estimates of the number of sink gillnet vessels and quantity of gear fished by area; 2) the NEFSC Gear Specialist (NMFS, *pers. comm.*) provided unit material costs for the gear and labor time required to convert to low risk gear; and 3) the U.S. Bureau of Labor Statistics provided hourly manufacturing labor rates. Data used in this analysis can be found in Table 5.1.2.9.

NEFSC observer data were used to estimate the quantity of gear fished, and NEFSC Vessel Trip Reporting (VTR) logbook and Dealer data were used to estimate the number of sink gillnet vessels fishing by area in Bisack (2000). In the northern nearshore area, sink gillnet vessels fish 10.3 net panels per string and 4.8 strings per trip on average (Table 5.1.2.9).[10] In the northern offshore area, sink gillnet vessels fish 18.4 net panels per string and 10.7 strings per trip.

Method to estimate the cost to convert to low risk gear
Gear conversion costs include the material and labor for replacing lines with neutrally buoyant line and attaching weak links. Based on observed sink gillnet trips, vessels currently use anchors with holding powers of a 22 lb danforth anchor or more and therefore this is a no cost item. We assume vessels choose neutrally buoyant line over sinking line since it is currently sold at a lower cost. A general method is presented here on how to calculate the material and labor costs of these gear conversions.

Material and labor cost of ground and anchor lines
The ground line runs from the end net panel to the anchor line. The length of the anchor line is approximately 100 feet. The ground line to the anchor line is the height of the net panel which is 10 feet on average times a slack factor of 1.5. Therefore at the end of each string, one anchor and ground line is 115 feet.

Material cost of ground and anchor lines (MC(AGL)) is the product of the number of strings (NS), two string ends (SE) ,the length of anchor and ground line (AGL) and the dollar price per unit ($/unit). Labor cost of the anchor and ground lines (LC(AGL)) is the product of the number of strings (NS), the length of the anchor and ground line (AGL), the time to measure 100 feet of line (TTM) plus 2 minutes to attach, and the hourly labor rate ($LR). In equation form we have:

$$MC(AGL) = NS * 2\,SE * AGL * \$ / unit$$
$$LC(AGL) = NS * 2\,SE * AGL * ((TTM / 60 minutes / 100\ feet) + 2/60) * \$LR$$

Material and labor cost of buoy lines
Material cost of buoy lines (MC(BL)) is the product of the number of strings (NS), the depth of the water (DOW), slack for tides (Slack=1.5), and the dollar price per unit ($/unit). Labor cost of the buoy lines (LC(BL)) is the product of the number of strings (NS), the depth of water times the slack, the time to measure 100 feet of line (TTM), and the hourly labor rate ($LR). In equation form we have:

---

[10] Sink gillnet vessels are divided into 2 length classes. Class I are vessels less than 40 feet and Class II sink gillnet vessels are 40 feet and greater. Typically vessels fishing in the northern nearshore waters are Class I vessels, and vessels fishing in the northern offshore area are Class II vessels.

$$MC(BL) = NS * DOW * Slack * \$ / unit)$$
$$LC(BL) = NS * (DOW * Slack * (TTM / 60minutes / 100\ feet) * \$LR)$$

Material and labor cost of 1100 pound weak links
Five 1100 pound weak links are required on each net panel. In the 2000 gear regulation, one 1100 pound weak link was required on each net panel. Therefore, under this proposed alternative, four 1100 weak links must be added. In addition, one 1100 pound weak links is required on the high flyer and one on the buoy ball. In the 2000 gear regulation, one 1100 pound weak link was required on the buoy line. Therefore only one 1100 weak link is required on the buoy line under this proposed alternative.

The number of 1100 pound weak links per string (WLS) is equal to 1 weak link at the buoy line per string (WL at BL) plus 4 weak links times the number of net panels per string (4 WL *NNP). The material cost of 1100 pound weak links (MC(WL)) is then equal to the number of strings fished per trip (NS) times the number of weak links per string (WLS) and the dollar price per unit ($/unit). Labor cost of the weak links (LC(WL)) is the product of the number of strings (NS), the number of weak links per string (WLS), the time to attach a weak link (TAWL), and the hourly labor rate ($LR).
In equation form we have:

$$WLS = 1\ WL\ at\ BL\ +\ 4\ WL\ *\ NNP)$$
$$MC(WL) = NS * WLS * \$ / unit$$
$$LC(WL) = NS * WLS * (TAWL / 60minutes) * \$LR$$

There are two types of 1100 pound weak links. One type of weak link is a 1/4" polyester rope which can be spliced in for a total cost of 7.3 cents per 3 foot weak link. As an alternative, Edic Dedoes of Somerville, Maine designed a small, melon sized football-shaped float that breaks away easily if a whale becomes entangled in a fishing net. The device is called a break-away float. If the break-away floats are available next year, the unit cost would be $3.

Cost to convert to low risk gear
The cost per vessel to convert to low risk gear in the northern nearshore area and northern offshore area is $779 and $4,085, respectively (Table 5.1.2.10). For the nearshore vessels, the cost of installing 1100 weak links, neutrally buoyant line on the buoy, anchor and ground line and a 3780 pound weak link is $489, $82, $196, and $11, totaling $779. Similarly it costs $1,927, $1,450, $681, and $25 to install 1100 weak links, neutrally buoyant line on the buoy, anchor and ground line and a 3780 pound weak link, respectively. The largest cost component for both vessel types is the 1100 pound weak links. If the break-away floats are available next year, the total cost per vessel for a nearshore vessel and offshore vessel is $1,358 and $6,389, respectively (Table 5.1.2.10).

We assume a vessel will take a 3 year business loan to pay for the up-front material and labor costs of converting to low risk gear.[11] Interest rates for short term business loans range between 6 percent and 11 percent depending on an individual's credit history. An average of 8.5 percent was used here. For a Class I vessel, the lower bound gear conversion cost is $799 (Table 5.1.2.16), and annual payments are $295 with a total loan payment of $885. With the upper bound cost of $1,358, annual payments are $514 with a total loan payment of $1,543. For a Class II vessel fishing in the offshore area, the lower bound gear conversion cost is $4,642, and annual payments are $1,547 with a total loan payment of $4,642. With the upper bound gear conversion cost of $6,389, annual payments are $2,420 with a total loan payment of $7,261.

SAM East

Estimate of the number of vessels

The number of vessels fishing sink gillnet gear in SAM East is 20, based on recorded fishing activity in NEFSC's 2000 VTR logbook. These vessels were between 40 and 60 feet in length (Class II) with an average of 48.4 feet (CV=0.15). Using the VTR data, sink gillnet vessels under 40 feet traveled a maximum of 42 nautical miles (CV=0.61). Vessels greater than 40 feet traveled of 100 nautical miles (CV=0.38). We consider sink gillnet vessels in the second class, greater than 40 feet, to be offshore vessels. Vessels less than 40 typically fish in nearshore and inshore management areas.

Revenues

According to the 2000 VTR logbook, these Class II vessels fished 130 days (CV=0.34), earned $302,800 (CV=0.66) in revenues and landed 238,564 pounds of fish (CV=0.50) per vessel per year. In Sam East, revenue and fish landings per sink gillnet vessel were $101,700 (CV=0.59) and 86,500 pounds of multi-species fish, respectively.

Variable and Fixed Vessel Expenses

Variable vessel expenses were collected by NEFSC placing observers on commercial sink gillnet trips. Variable expenses include fuel, ice, water, food and oil used per fishing trip. Data were averaged over years 1994 to 2000 to develop an estimate of a vessel's variable expense per "days absent" from port, and stratified by four gross tonnage vessel classes. The variable cost per days absent was then applied to the number of days a vessel reported being absent according

[11] The shelf life of neutrally buoyant line is unknown. Typically ground and buoy lines made of polypropylene are replaced every 6 years on average (NMFS, *pers. comm.*). The neutrally buoyant line may have a shorter life since the fibers of the rope will be in contact with the sediment more compared to the existing polypropylene line. We assume a vessel would not want to have a loan payment for a product that is longer the life of the product. We therefore chose 3 years as the term length of the loan.

to their logbook. Since these vessels are all greater than 40 feet they are considered offshore vessels. The annual variable cost per offshore sink gillnet vessel is $19,098 (CV=0.56).

There was a limited amount of data available on fixed cost for the sink gillnet fishery. First we assumed the cost of licenses and permits, and mooring and docking fees would be similar to the fees paid by a vessel fishing lobster gear (Table 5.1.2.3). Fixed costs also include loss of gear. As a rough estimate of gear loss we assumed each vessel would lose one string of gear each year. The replacement cost of one string is $3,469 for an offshore vessel (Table 5.1.2.11). In addition we included the cost of replacing the webbing within each net panel. Given a panel of webbing sells for $45 on average, the total annual cost of replacing the webbing for an offshore vessel is $8,860. Therefore total fixed gear replacement costs are estimated at $12,329 (Table 5.1.2.11).[12] Total fixed costs are $16,391 per vessel.

Results
The average sink gillnet vessel fishing in SAM East earns $133,150 in profits (Table 5.1.2.12) without this regulation. Revenues were $302,800 minus $35,500 for variable and fixed expenses leaving a remaining revenue of $267,300. Labor is then 50 percent of the remaining revenues or $133,650, and profits is also 50 percent of the remaining revenues.

If this regulation is imposed a vessel's profits will be reduced by 1.2 percent, given the polyester rope is used as an 1100 weak link. If the break-away floats become available and the vessel owner decided to use this versus the polyester rope, a vessel's profits would be reduced by 1.8 percent under this proposed regulation.

Finally, it appears the cost an offshore vessel fishing in SAM East may incur to convert to low risk gear will allow the vessel to continue to fish and earn profits.

SAM West
Estimate of the number of vessels
According to the 2000 VTR there are 11 sink gillnet vessels fishing in SAM West from March 1 to April 30. Of these 11 vessels, 4 vessels are less than 40 feet (Class I) in length with an average of 36.8 feet (CV=0.06), and 7 vessels are greater than 40 feet in length (Class II) with an average of 45.9 feet (CV=0.11).

[12] This estimate is considered downwardly biased since it does not include interest and loan payments, insurance, property taxes or fixed costs for shore front property.

Revenues
According to the 2000 VTR logbook, annual revenues for Class I vessels were $210,900 (CV=0.73) and they landed 119,300 (CV=0.68) pounds of multi-species fish per year. Class II vessels earned annual revenues of $252,200 (CV=0.46) and landed 180,600 (CV=0.45) pounds of multi-species fish per year.

Class I vessels fishing in SAM West (less than 40 feet) earned revenues of $72,300 (CV=0.74) and landed 59,800 (CV=0.77) pounds of fish. Class II vessels (greater than 40 feet in length) fishing in SAM West earned $76,000 (CV=0.70) in revenues and landed 76,000 (CV=0.69) pounds of fish.

Variable and Fixed Vessel Expenses
Total variable expenses for a Class I vessel were $12,435 (CV=0.72) per year. This includes the cost of fuel, ice, water, food, bait and oil. NEFSC observer data were used to develop this estimate which is based on a cost per days absent from port. These four vessels were absent 106.5 (CV=0.67) days per year on average.

Fixed expenses include the replacement cost of lost gear, annual gear replacement such as the panel webbing, license and docking fees. We assume sink vessels under 40 feet in length incur expense of $1,197 (=$208+$989) for licenses, permits, mooring and docking fees similar to lobster vessels less than 35 feet in length (Table 5.1.2.5). Given a vessel loses one string of sink gillnet gear per year, the replacement cost is $1,985 and it costs $2,225 to replace the panel webbing annually for a total of $4,210 (Table 5.1.2.11). Annual fixed costs are therefore $5,407[13]. Annual variable and fixed vessel expenses for a Class I sink gillnet vessel is $17,842 on average.

Total variable expenses for a Class II vessel were $18,743 (CV=0.31) per year. This includes the cost of fuel, ice, water, food, bait and oil. NEFSC observer data were used to develop this estimate which is based on a cost per days absent from port. These seven vessels were absent 145 (CV=0.67) days per year on average.

Fixed expenses include the replacement cost of lost gear, annual gear replacement such as the panel webbing, license and docking fees. We assume sink vessels greater than 40 feet in length incur expense of $4,062 (=$573+$3,489) for licenses, permits, mooring and docking fees similar to lobster vessels less than 50 feet in length (Table lobster). Given a vessel loses one string of sink gillnet gear per year, the replacement cost is $3,469 and it costs $8,860 to replace the panel webbing annually for a total of $12,329 (Table 5.1.2.11).

[13] This estimate is considered downwardly biased since it does not include interest and loan payments, insurance, property taxes or fixed costs for shore front property.

Annual fixed costs are therefore $16,391.[14] Finally, annual variable and fixed vessel expenses for a Class II sink gillnet vessel is $35,134 on average.

Results of profit analysis
The average Class I sink gillnet vessel fishing in SAM West earns a profit of $96,500 per year without this regulation. Annual revenues were $210,900 minus $17,900 for variable and fixed vessels expenses, leaving a remaining revenue of $193,000. Labor and profits are 50 percent each of the remaining revenues. Therefore annual vessel profits are $96,500 (Table 5.1.2.13).

If this regulation is imposed, profits will be reduced by less than 0.3 percent given a sink gillnet vessel converts to low risk gear. This assumes the vessel uses a 1/4" polyester rope as the 1100 pound weak link. Alternatively, if a vessel chooses to use the new break-away float, a vessel's profits will be reduced by 0.5 percent. It appears that a sink gillnet vessel under 40 feet can convert to low risk gear, continue to fish and earn profits.

Class II sink gillnet vessels fishing in SAM West earned a profit of $108,500 per year without this regulation. Annual revenues were $252,200 minus $35,200 for variable and fixed vessels expenses, leaving a remaining revenue of $217,000. Labor and profits are 50 percent each of the remaining revenues. Therefore annual vessel profits are $108,500 (Table 5.1.2.14).

If this regulation is imposed, profits will be reduced by less than 1.4 percent given a sink gillnet vessel converts to low risk gear. This assumes the vessel uses a 1/4" polyester rope as the 1100 pound weak link. Alternatively, if a vessel chooses to use the new break-away float, a vessel's profits will be reduced by 2.2 percent. It appears that a Class II sink gillnet vessel can convert to low risk gear, continue to fish and earn profits.

5.1.2.3 Summary of PA

Three potential scenarios considered as to how the fishing industry may react to this PA include: 1) convert to low risk gear and continue fishing in SAM; 2) do not convert to low risk gear and choose not to fish during this time period; or 3) do not convert to low risk gear, fish outside of the SAM area until it reopens and then move the non-low risk gear inside SAM. Each scenario will be discussed in this summary section.

[14] This estimate is considered downwardly biased since it does not include interest and loan payments, insurance, property taxes or fixed costs for shore front property.

Scenario 1: Vessels convert to low risk gear
Vessels fishing both lobster and sink gillnet gear have been grouped by size classes. The annual cost of converting to low risk gear ranges between a low of $295 for a Class I sink gillnet vessel in SAM West to a high of $28,902 for a Class III lobster vessel in SAM East (Table 5.1.2.15). In general we assume vessels fishing lobster gear will take out a 3 year term loan at 8.5 percent to pay for the cost of converting their gear.

Under this scenario, Class III lobster vessels in SAM East can incur the cost of converting their gear, continue to fish and earn a profit. Their annual profits are reduced by a maximum of 8.4 percent under the PA (Table 5.1.2.15). Class III lobster vessels in SAM West have profits reduced by a maximum of 25 percent. This reduction is more severe compared to SAM East Class III vessels, however, they may continue to fish and earn profits. Alternatively, Class I lobster vessels in SAM West have their annual profits reduced by a maximum of 49 percent. It is not cost effective for these vessels to convert their gear since their revenues ($267) are less than the annual lower bound cost for low risk gear ($944).

Class I and Class II vessels fishing sink gillnet gear in SAM East and West should be able to incur the cost of converting to low risk gear, continue to fish and earn profits. In SAM East, profits for Class II sink gillnet vessels were reduced by 1.2 percent and if these vessels choose to use the break-away float versus a 1/4" polyester rope as a 1100 pound weak link, then their profits are reduced by a maximum of 1.8 percent (Table 5.1.2.15). In SAM West, if the 1/4" polyester rope is used, then profits for Class I and Class II sink gillnet vessels were reduced by 0.3 percent and 1.4 percent, respectively. If these vessels choose the break-away float as a weak link, profits will be reduced by a maximum of 0.5 percent and 2.2 percent for Class I and Class II sink gillnet vessels, respectively.

Finally, the total lower and upper bound industry gear conversion costs for 49 vessels in the lobster and sink gillnet fleet are $196.0K (=$194,144+1,869) and $387.3K (=$385,318+$1,869), respectively (Table 5.1.2.16). This estimate includes the annual loan payment a lobster and sink gillnet vessel will pay to convert to low risk gear.

The total lower and upper bound industry costs for the lobster fleet are $96.5K and $319.8K, respectively. This assumes Class I lobster vessels in SAM West will choose not to fish or convert their gear. The estimate is low since it only includes forgone revenues and not the cost of moving their gear out of SAM. Total lower and upper bound industry costs for the sink gillnet fleet are $43.0K and $435.8K, respectively.

Scenario 2: Vessels choose not to fish or convert their gear
As a second scenario, a vessel may choose not to convert to low risk gear or fish. Vessels incur the cost of removing and resetting their

gear in the water, plus forgone revenues. Based on the estimated profit reductions all vessels, except Class I lobster vessels in SAM West, are likely to convert to low risk gear. These vessels must weigh their loss in profits against the risk they take of losing fishing bottom to another vessel. That is, once gear is removed from an area, it is open for any other vessel to fish it given they comply with this regulation.

In summary, if only Class I lobster vessels in SAM West chose this alternative, the vessel and industry loss in forgone revenues would be $1,869 (Table 5.1.2.16). If all vessels chose this option, industry forgone revenues would be $4.1M. This would be considered downwardly biased since it does not include the cost of removing and resetting the gear in the water.

Scenario 3: Vessels choose to fish outside of SAM and not convert their gear
In the third scenario, a vessel may choose not to convert to low risk gear and fish outside of SAM East. In this case, the vessel's revenue's would be influenced by the catch rates inside and outside of the closed area. If the catch rates are lower outside and there is bottom available to fish, vessel profits would be reduced. In addition, the vessel would incur the extra labor and fuel cost associated with moving and resetting their gear inside and out of SAM East. They also take the risk of losing their fishing territory in SAM East to another vessel. This option may be a likely candidate for lobster vessels fishing in SAM West.

Conclusion:
All sink gillnet vessels are likely to choose scenario 1 since annual profits are reduced by a maximum of 2.2 percent. Class I lobster vessels in SAM East are also likely to choose scenario 1. However, Class I lobster vessels in SAM West are probably better off with scenario 2 and Class III vessels with scenario 3.

5.1.3 Social Impacts

It is important to note that restrictions within SAM may be in addition to other closures and restrictions under the Magnuson-Stevens Act. Restricting fishing in SAM areas may result in reduced employment if vessels do not modify gear for fishing during the restricted periods or do not fish in alternative areas not subject to restrictions. Alternatively, SAM restrictions may shift fishing effort outside the SAM zone into adjacent unregulated areas. This shift in effort may require more time away from family, friends, and community as fishermen may need to travel further to reach unrestricted fishing grounds. However, effort may be shifted inshore, perhaps closer to family, friends, and community.

Social benefits may be realized if SAM is effective at reducing the risk to right whales, and other marine mammals and sea turtles, of

serious injury and mortality from entanglements. If this reduced risk increases the potential for recovery, then society will benefit by preventing the loss of a species and preserving marine biodiversity. While SAM places time and area restrictions on fishing practices, it does not prohibit fishing all together. In light of that fact, social benefits are realized from the application of management practices that demonstrate that fishing and marine mammals can co-exist.

5.2 NO ACTION

The No Action alternative would leave in place the existing regulations promulgated under the ALWTRP. The existing regulations already state that the AA may revise the regulations through notice in the Federal Register in order to close areas, open areas, and change boundaries of a closed area or for similar purpose (§ 229.32(g)(2)). However, in the absence of this rule, it is not clear whether NMFS would have the authority to implement SAM through the existing regulations. In addition, if the No Action alternative is adopted, then the regulations would lack defined areas and time periods for implementing SAM restricted zones.

5.2.1 Biological Impacts

In the BOs completed on the lobster, monkfish, multispecies, and dogfish fisheries, it was concluded that additional protections were needed to avoid jeopardy to right whales. SAM, a management program to reduce the risk of entanglement for concentrations of right whales, was identified as an integral component of the strategy to avoid jeopardy. The ESA requires the use of the best available scientific data and NMFS believes that the NEFSC analysis identifying Seasonal Area Management Zones in the North Atlantic satisfies this standard. Implementation of another mechanism without scientific support would not appear to be consistent with the ESA. The success of SAM depends to a great extent on whether NMFS is able to identify areas with predictable annual concentrations of right whales, educate the regulated community of those areas, and achieve compliance with any restrictions that are implemented. Completion of rulemaking for implementing SAM would have positive biological consequences for right whales if public participation results in the establishment of more appropriate SAM zones and greater compliance by fishermen with restrictions on fishing within SAM zones. Conversely, adopting the No Action alternative could be viewed as foregoing an opportunity to improve protection of right whales by avoiding the opportunity to benefit from public participation in the decision-making process and from possible increased compliance with SAM restrictions.

5.2.2 Economic Impacts

Effectiveness of the RPA in avoiding jeopardy is of obvious benefit to the right whales, but is also of benefit to the fisheries. If the RPA is not successful at avoiding jeopardy, then additional and more

stringent measures would have to be adopted. These measures would be likely to have greater economic impacts on the commercial fishing industry, including the potential cessation of fishing.

5.2.3 Social Impacts

Under the No Action alternative, fishing practices are not further restricted and, therefore, at least in the short-term, impacts to employment, family, and community are minimized. However, if the failure to take action now to minimize impacts on right whales results in the need to take more aggressive action at a later date, the consequences to employment, family, and community would be greatly increased from that seen under the PA.

If the failure to take action results in an increased risk of extinction to the North Atlantic right whale, then there are significant social impacts associated with such an omission. The extinction of the right whale would be a loss to society, which has placed an incalculable value on the protection of all species for their intrinsic value as well as for their contribution to biodiversity. By failing to take action, the Secretary of Commerce would not be carrying out responsibilities imposed on him by society under the ESA, which impose a duty on him to ensure that all action he authorizes, such as commercial fishing, are not likely to jeopardize the continued existence of threatened and endangered species.

5.3 GEAR RESTRICTIONS THROUGHOUT THE DESIGNATED TIME FRAME

This alternative would implement one SAM zone comprised of the two separate SAM zones described in section 3.1 with gear restrictions required throughout the entire area during the designated time frame.

5.3.1 Biological Impacts

From the data collected during the 3 years of aerial surveys, it was determined that the core SAM area, in combination with the existing Cape Cod Bay and Great South Channel Restricted Areas, encompassed 134 (90 percent) of the 149 events from 1999-2001. The analysis of this data also led to the finding that, within the core SAM area, right whale events occur more frequently in the western part of the zone (near Cape Cod Bay and the Great South Channel) in March-April than in June-July. For example, 13 of the 15 events outside of the Cape Cod Bay and Great South Channel Restricted Areas occurred in the area NMFS has defined as SAM West, which lies west of 69E 24' W longitude. Conversely, during May-July, all of the events within the area defined as SAM East, which were not in the Great South Channel Restricted Area, were east of 69E 24' W longitude. This analysis strongly suggests that right whales migrate from west to east within the SAM core area between the months of March and July. Therefore, NMFS does not believe that the scientific data supported a single SAM zone covering the entire area for the duration of the 5 month period.

5.3.2 Economic Impacts of Non-Preferred Alternative 1 (NPA 1)

Under the NPA 1 plan vessels fishing lobster or sink gillnet gear must modify their gear to continue fishing in the area identified as SAM East and SAM West (March 1 to July 31). Several potential scenarios exist as to how the fishing industry may adapt to this proposed action. The scenarios include: 1) convert to low risk gear and continue fishing in SAM; 2) choose not to fish or convert to low risk gear; or 3) fish outside of the SAM area, do no convert to low risk gear, and move gear back into SAM when it reopens.

The economic analysis of the preferred alternative is divided into three sections. Section 5.3.2.1 and 5.3.2.2 investigates the consequences of scenario 1 for the lobster and sink gillnet fleet, respectively. The results of the first two sections under scenario 1 are then summarized in Section 5.3.2.3. This summary section then ends with a discussion of scenario 2 and 3 as identified above.

5.3.2.1 Lobster Fleet

In this section we present the economic impacts of closing SAM East and SAM West from March 1 to July 31 on the lobster fleet. To continue fishing in these areas a vessel must convert to low risk gear. We start by presenting the cost of converting to low risk gear. The economic impact of SAM East and West on the lobster fleet are evaluated next. This includes estimating the number of vessels fishing in the area, revenues earned per vessel, annual variable and fixed vessel expenses and we end with results of a break even analysis results.

Cost to convert to low risk gear

The lower and upper bound cost per vessel to convert to low risk gear in the northern nearshore area is $2,493 and $7,508, respectively (Table 5.1.2.2). In the northern offshore area, the lower and upper bound cost per vessel is $36,284 and $76,298, respectively. The largest cost component is the material cost of replacing existing ground lines with neutrally buoyant line. In the northern nearshore area material cost of neutrally buoyant ground line is 77 percent of the total cost and it consumes 90 percent of the total cost for the northern offshore vessels.

We assume a vessel will take a 3 year business loan to pay for the up-front material and labor costs of converting to low risk gear.[15]

---

[15] The shelf life of neutrally buoyant line is unknown. Typically ground and buoy lines made of polypropylene are replaced every 6 years on average (NMFS, *pers. comm.*). The neutrally buoyant line may have a shorter life since the fibers of the rope will be in contact with the sediment more compared to the existing polypropylene line. We assume a vessel would not want to have a loan payment for a product that is longer the life of the product. We therefore chose 3 years as the term length of the loan.

Interest rates for short term business loans range between 6 percent and 11 percent depending on an individual's credit history. An average of 8.5 percent was used here. For a vessel fishing in the nearshore area, the lower bound gear conversion cost is $2,491 (Table 5.1.2.2), and annual payments are $944 with a total loan payment of $2,833. With the upper bound cost of $7,508, annual payments are $2,843 with a total loan payment of $8,530. For a vessel fishing in the offshore area, the lower bound gear conversion cost is $36,284, and annual payments are $13,745 with a total loan payment of $41,234. With the upper bound gear conversion cost of $76,298, annual payments are $28,902 with a total loan payment of $86,707. For details of the on how these estimates were derived, see Section 5.1.2.1.

SAM East/West (March 1 to July 31)

Estimate of the number of vessels

The lower and upper bound estimate of vessels fishing in SAM East and SAM West from March 1 to July 31, 2000 is 50 and 193 vessels, respectively. According to the VTR data, there are 220 vessels fishing in the northern nearshore and offshore area during this time period. Of these 220 vessels 22.7 percent (50 vessels) had recorded fishing activity in SAM East and West.

The upper bound estimate of vessels fishing in SAM East and West is 193 vessels. Using Bisack (2000) approximately 172 vessels potentially fish in the northern offshore area and 677 vessels fish in the nearshore area. According to the VTR, approximately 22.7 percent of the vessels fish in SAM East and West from March 1 to July 31. Therefore the upper bound estimate of vessels fishing in SAM East and West is 193 (192.7=0.227*(172+677)). We assume the upper bound estimate of the number of vessels fishing in SAM East and West is 193 from March 1 to July 31.

Revenues and landings

Class I vessels fished 70.3 trips (CV=0.72), landed 7,400 pounds of lobster (CV=1.11)and earned $29,900 in revenues (CV=1.10) per year. In Class II, vessels fished 80.0 trips (CV=0.97) or absent 103 days, landed 26,600 pounds of lobster (CV=0.75) and earned $120,200 in revenues (CV=0.72) per year. In the largest length class, Class III, vessels fished 98 trips (CV=0) or absent 216 days, landed 169,800 pounds of lobster (CV=0.19), and earned $740,900 in revenues (CV=0.21) per year.

According to the 2000 VTR logbook, in SAM East and West, from March 1 to July 31, 2000, there were 50 vessels fishing of which 28 are Class I vessels, 17 Class II vessels, and 5 are Class III vessels. Revenues in SAM East and West were $8,711 (CV=1.01), $30,800 (CV=0.87), and $177,300 (CV=0.59) for Class I to Class III vessels, respectively.

Variable and Fixed Vessel Expenses

Using Gates (1995), variable and fixed expenses of Class I vessels fishing in SAM East and West were prorated from fishing 159 days to 70.3 days per year. Annual variable expenses are $15,553 and fixed expenses are $9,984 for Class I vessels, for a total of $25,537.

Expenses for Class II vessels were presented here for the first time based on Gates (1995). Gates sampled 11 Class II vessels with an average vessel length of 40 feet. Annual variable expenses were $33,627 and fixed expenses were $10,645, for a total of $44,272 (Table 5.3.2.1). Finally, annual variable expenses for Class III vessels were $352,048 and fixed expenses were $72,930, for a total of $427,978 (See Table 5.1.2.3. under the PA for SAM East).

Results of Break Even Analysis

Class I lobster vessels

Without the proposed alternative, Class I lobster vessels have a break even quantity of landing 5,260 pounds of lobster, which is 71 percent of their annual landings (Table 5.3.2.2). The break even quantity is based on an annual time frame. The break even quantity increases by 9 percent and 28 percent for the lower and upper bound gear conversion cost. At the upper bound, the break even quantity is 91 percent of annual landings, compared to 71 percent without the regulation.

These vessels earn annual profits of $4,362 and land 7,400 pounds of lobster per year on average (Table 5.3.2.2). If a Class I lobster vessel incurred the lower or upper bound cost of converting to low risk gear, annual profits would decrease by 22 percent and 65 percent, respectively. If vessels incur the lower bound cost of converting their gear they may continue to fish and earn profits, however they may not continue to fish if they incur the upper bound gear conversion cost.

Class II lobster vessels

Without the proposed alternative, Class II lobster vessels have a break even quantity of landing 3,891 pounds of lobster, which is 15 percent of their annual landings (Table 5.3.2.3). The break even quantity increases by 9 percent and 27 percent for the lower and upper bound gear conversion cost. At the upper bound, the break even quantity is 19 percent of annual landings, compared to 15 percent without the regulation.

These vessels earn annual profits of $75,929 and land 26,600 pounds of lobster per year on average (Table 5.3.2.3). If a Class II lobster vessel incurred the lower and upper bound cost of converting to low risk gear, annual profits would decrease by 1 percent and 4 percent, respectively. If vessels incur the lower or upper bound cost of converting their gear they may continue to fish and earn profits.

Class III lobster vessels

Without the proposed alternative, Class III lobster vessels have a break even quantity of landing 39,410 pounds of lobster, which is 23 percent of their annual landings (Table 5.3.2.3). The break even quantity increases by 18 percent and 38 percent for the lower and upper bound gear conversion cost. At the upper bound, the break even quantity is 32 percent of annual landings, compared to 23 percent without the regulation.

These vessels earn annual profits of $312,922 and land 169,800 pounds of lobster per year on average (Table 5.3.2.4). If a Class III lobster vessel incurred the lower and upper bound cost of converting to low risk gear, annual profits would decrease by 4 percent and 9 percent, respectively. If vessels incur the lower or upper bound cost of converting their gear they may continue to fish and earn profits.

5.3.2.2 Sink Gillnet Fleet

In this section we present the economic impacts of SAM East and SAM West on the sink gillnet fleet. To continue fishing in these areas a vessel must convert to low risk gear. We start this section by presenting the cost of converting sink gillnet gear to low risk gear. The economic impact of SAM East and West from March 1 to July 31 on the sink gillnet fleet follows. This includes estimating the number of vessels fishing in the area, revenues earned per vessel, annual variable and fixed vessel expenses and we end with the results of a vessel profit analysis. For method details see Section 5.1.2.2 under the sink gillnet fleet in the PA.

Cost to convert to low risk gear

The cost per vessel to convert to low risk gear in the northern nearshore area and northern offshore area is $779 and $4,085, respectively (Table 5.1.2.10). For the nearshore vessels, the cost of installing 1100 pound weak links, neutrally buoyant line on the buoy, anchor and ground line and a 3780 pound weak link is $489, $82, $196, and $11, totaling $778. Similarly it costs $1,927, $1,450, $681, and $25 to install 1100 pound weak links, neutrally buoyant line on the buoy, anchor and ground line and a 3780 pound weak link, respectively. The largest cost component for both vessel types is the 1100 pound weak links. If the break-away floats are available next year, the total cost per vessel for a nearshore vessel and offshore vessel is $1,358 and $8,316, respectively (Table 5.1.2.10).

We assume a vessel will take a 3 year business loan to pay for the up-front material and labor costs of converting to low risk gear.[16] Interest rates for short term business loans range between 6 percent and 11 percent depending on an individual's credit history. An average of 8.5 percent was used here. For a Class I vessel, the lower bound gear conversion cost is $799 (Table 5.1.2.2), and annual payments are $295 with a total loan payment of $885. With the upper bound cost of $1,358, annual payments are $514 with a total loan payment of $1,543. For a Class II vessel fishing in the offshore area, the lower bound gear conversion cost is $4,642, and annual payments are $1,547 with a

[16] The shelf life of neutrally buoyant line is unknown. Typically ground and buoy lines made of polypropylene are replaced every 6 years on average (NMFS, pers. comm.). The neutrally buoyant line may have a shorter life since the fibers of the rope will be in contact with the sediment more compared to the existing polypropylene line. We assume a vessel would not want to have a loan payment for a product that is longer the life of the product. We therefore chose 3 years as the term length of the loan.

total loan payment of $4,642. With the upper bound gear conversion cost of $6,389, annual payments are $2,420 with a total loan payment of $7,261.

SAM East/West

Estimate of the number of vessels

The number of sink gillnet vessels fishing in SAM East and West from March 1 to July 31,2000 according to the VTR is 59 vessels. Of these 59 vessels, 14 vessels were less than 40 feet with an average of 36.7 (CV=0.07), and 46 vessels were greater than 40 feet in length with an average of 46.7 feet (CV=0.13).

Revenues

According to the 2000 VTR logbook, annual revenues for vessels less than 40 feet were $154,200 (CV=0.61) and they landed 129,600 (CV=0.63) pounds of multi-species fish per year. Vessels greater than 40 feet earned annual revenues of $273,600 (CV=0.63) and landed 210,800 (CV=0.53) pounds of multi-species fish per year.

Class I sink gillnet vessels fishing in SAM East and West earned revenues of $72,600 (CV=0.67) and landed 70,200 (CV=0.58) pounds of fish. Class II sink gillnet vessels fishing in SAM East and West earned $119,800 (CV=0.72) in revenues and landed 101,500 (CV=0.60) pounds of fish.

Variable and Fixed Vessel Expenses

Total variable expenses for a Class I sink gillnet vessel were $10,025 (CV=0.48) per year. This includes the cost of fuel, ice, water, food, bait and oil. NEFSC observer data were used to develop this estimate which is based on a cost per days absent from port. These fourteen vessels were absent 100.6 (CV=0.38) days per year on average.

Fixed expenses include the replacement cost of lost gear, annual gear replacement such as the panel webbing, license and docking fees. We assume Class I sink vessels (under 40 feet in length) incur expense of $1,197 (=$208+$989) for licenses, permits, mooring and docking fees similar to lobster vessels less than 35 feet in length (Table 5.1.2.5). Given a vessel loses one string of sink gillnet gear per year, the replacement cost is $1,985 and it costs $2,225 to replace the panel webbing annually for a total of $4,210 (Table 5.1.2.11). Annual fixed costs are therefore $5,407.[17] Annual variable and fixed vessel expenses for a sink gillnet vessel under 40 feet in length is $15,432 on average.

Total variable expenses for a Class II sink gillnet vessels were $17,982 (CV=0.49) per year. This includes the cost of fuel, ice, water, food, bait and oil. NEFSC observer data were used to develop this estimate which is based on a cost per days absent from port.

[17] This estimate is considered downwardly biased since it does not include interest and loan payments, insurance, property taxes or fixed costs for shore front property.

These seven vessels were absent 129.3 (CV=0.31) days per year on average.

Fixed expenses include the replacement cost of lost gear, annual gear replacement such as the panel webbing, license and docking fees. We assume sink vessels greater than 40 feet in length incur expense of $4,062 (=$573+$3,489) for licenses, permits, mooring and docking fees similar to lobster vessels greater than 50 feet in length (Table 5.1.2.3). Given a vessel loses one string of sink gillnet gear per year, the replacement cost is $3,469 and it costs $8,860 to replace the panel webbing annually for a total of $12,329 (Table 5.1.2.11). Annual fixed costs are therefore $16,391.[18] Finally, annual variable and fixed vessel expenses for a Class II sink gillnet vessel is $34,373 on average.

Results of profits analysis

The average Class I sink gillnet vessel fishing in SAM East and West from March 1 to July 31, earned a profit of $69,400 per year without this regulation in 2000 (Table 5.3.2.5). Annual revenues were $154,200 minus $15,400 for variable and fixed vessels expenses, leaving a remaining revenue of $138,800. Labor and profits are 50 percent each of the remaining revenues. Therefore annual vessel profits are $69,400.

If this regulation was imposed, profits would be reduced by 0.4 percent given a sink gillnet vessel converts to low risk gear. This assumes the vessel uses a 1/4" polyester rope as the 1100 pound weak link. Alternatively, if a vessel chooses to use the new break-away float, a vessel's profits will be reduced by 0.7 percent. It appears that a Class I sink gillnet vessel can absorb the cost of converting to low risk gear, continue to fish and earn profits.

Class II sink gillnet vessels fishing in SAM East and West earned a profit of $119,600 per year without this regulation in 2000 (Table 5.3.2.6). Annual revenues were $273,600 minus $34,400 for variable and fixed vessels expenses, leaving a remaining revenue of $239,200. Labor and profits are 50 percent each of the remaining revenues. Therefore annual vessel profits are $119,600.

If this regulation is imposed, profits will be reduced by less than 1.3 percent given a sink gillnet vessel converts to low risk gear. This assumes the vessel uses a 1/4" polyester rope as the 1100 pound weak link. Alternatively, if a vessel chooses to use the new break-away float, a vessel's profits will be reduced by 2.0 percent. It appears that a Class II sink gillnet vessel can absorb the cost of converting to low risk gear, continue to fish and earn profits.

[18] This estimate is considered downwardly biased since it does not include interest and loan payments, insurance, property taxes or fixed costs for shore front property.

5.3.2.3 Summary of NPA 1

Three potential scenarios considered as to how the fishing industry may react to this alternative include: 1) convert to low risk gear and continue fishing in SAM; 2) do not convert to low risk gear and choose not to fish during this time period; or 3) do not convert to low risk gear, fish outside of the SAM area until it reopens and then move the gear back inside SAM. Each scenario will be discussed in this summary section.

Scenario 1: Vessels convert to low risk gear
Vessels fishing both lobster and sink gillnet gear have been grouped by size classes. The annual cost of converting to low risk gear ranges between a low of $295 for a Class I sink gillnet vessel in SAM West to a high of $28,902 for a Class III lobster vessel in SAM East (Table 5.1.2.15). In general we assume vessels fishing lobster gear will take out a 3 year term loan at 8.5 percent to pay for the cost of converting their gear.

Under this scenario, Class II and Class III lobster vessels in SAM East and West from March 1 to July 31 can absorb the cost of converting their gear, continue to fish and earn a profit. Their annual profits are reduced by a minimum of 1 percent and a maximum of 9 percent under this alternative (Table 5.3.2.7). Alternatively, Class I lobster vessels in SAM East and West had their annual profits reduced by a maximum of 65 percent. It may not be cost effective for these vessels to convert their gear.

Class I and Class II vessels fishing sink gillnet gear in SAM East and West should also be able to absorb the cost of converting to low risk entanglement gear, continue to fish and earn profits. In SAM East and West, profits were reduced by a minimum of 0.4 percent and a maximum of 2.0 percent (Table 5.3.2.7).

Finally, the total lower and upper bound industry gear conversion costs for 253 vessels in the lobster and sink gillnet fleet are $1,338.4.4K (=$398,751+$939,600) and $1,794.2K (=$854,632+$939,600), respectively (Table 5.3.2.8). This estimate includes the annual loan payment a lobster and sink gillnet vessel will pay to convert to low risk gear.

The total lower and upper bound industry costs for the lobster fleet are $1,263.1K and $1,675.7K, respectively. This assumes Class I lobster vessels in SAM East and West will choose not to fish or convert their gear. The estimate is low since it only includes forgone revenues and not the cost of moving their gear out of SAM. Total lower and upper bound industry costs for the sink gillnet fleet are $75.3K and $118.5K, respectively.

Scenario 2: Vessels choose not to fish or convert their gear
As a second scenario, a vessel may choose not to convert to low risk gear or fish. Vessels incur the cost of removing and resetting their gear in the water, plus forgone revenues. Based on the estimated

profit reductions all vessels, except Class I lobster vessels in SAM West, are likely to convert to low risk gear. These vessels must weigh their loss in profits against the risk they take of losing fishing bottom to another vessel. That is, once gear is removed from an area, it opens for any other vessel to fish it given they comply with this regulation.

In summary, if only Class I lobster vessels in SAM West chose this alternative, the vessel and industry loss in forgone revenues would be $939.6K (Table 5.3.2.8). If all vessels chose this option, industry forgone revenues would be $11.3M, of which $4.8M is associated with the lobster fleet, and $6.5M with the sink gillnet fleet. This would be considered downwardly biased since it does not include the cost of removing and resetting the gear in the water.

Scenario 3: Vessels choose to fish outside of SAM and not convert their gear. In the third scenario, a vessel may choose not to convert to low risk gear and fish outside of SAM East and West from March 1 to July 31. In this case, the vessel's revenues would be influenced by the catch rates inside and outside of the closed area. If the catch rates are lower outside and there is bottom available to fish, vessel profits would be reduced. In addition, the vessel would incur the extra labor and fuel cost associated with moving and resetting their gear inside and out of SAM. They also take the risk of losing their fishing territory in SAM to another vessel. This option may be a likely candidate for Class I lobster vessels fishing in SAM.

Conclusion: All sink gillnet vessels are likely to choose scenario 1 since annual profits are reduced by a maximum of 2.0 percent. Class II and Class III lobster vessels in SAM are also likely to choose scenario 1. However, Class I lobster vessels in SAM are probably better off with scenario 3.

5.3.2 Social Impacts

The social impact of this alternative are similar to, but slightly greater than those associated with the preferred alternative. Restricting lobster trap and gillnet fishing within one SAM zone during a 5 month period would affect more fishing vessels over a greater area (ca. 7,000 nm^2) for a longer period of time than the PA. Implementation of this alternative could result in unemployment if vessels cannot afford to modify their gear or are not able to relocate to other unrestricted areas. In addition, there may be negative impacts to the fishing community if more time is required to reach other fishing grounds because of extended separation from family, friends, and community. Alternatively, fishing effort may be shifted inshore, perhaps closer to family, friends, and community.

This alternative would create one SAM zone with fishing restrictions in place from March to July, which would be likely to reduce the potential for serious injury and mortality to right whales from entanglements. Therefore, there wold be a reduction in the potential for extinction of right whales, which has a positive social benefit by

protecting a critically endangered species and preserving overall marine biodiversity.

5.4 GEAR RESTRICTIONS LIFTED SEQUENTIALLY OVER TIME AS RIGHT WHALE CONCENTRATIONS MOVE THROUGH THE AREA

Under this alternative, NMFS would implement a single SAM zone based in the description in section 3.1 with gear restrictions initially required throughout the zone, but lifted sequentially over time as concentrations of right whales move across the zone from west to east.

5.4.1 Biological Impacts

This alternative is similar to the one described in section 5.3 with the only difference being the sequential lifting of gear restrictions as right whales migrate across the SAM zone from west to east instead of maintaining gear restrictions for the 5 month duration of the SAM zone. The analysis of the aerial surveys found that, during the 3 years data was collected, right whales consistently migrated across the core SAM area from west to east between the months of March and July. Therefore, this alternative acknowledges and responds to the most recent scientific study of right whale distribution and abundance in the Gulf of Maine. However, although sequential openings would make this alternative somewhat less burdensome than sustaining restrictions over the entire area for a 5 month period, implementation of this alternative presents significant logistical difficulties inherent in the regular monitoring and surveillance of right whales over such a large area.

5.4.2 Economic Impacts of Non-Preferred Alternative 2 (NPA 2)

Under this alternative, a single SAM zone based on the description in section 3.1 with gear restrictions initially required throughout the zone, but lifted sequentially over time as concentrations of right whales move across the zone from west to east. Under this alternative, aerial surveys are required to determine whether right whales are present in the proposed closure.

Three potential scenarios considered as to how the fishing industry may react to this preferred alternative include: 1) convert to low risk gear and continue fishing in SAM; 2) do not convert to low risk gear and choose not to fish during this time period; or 3) do not convert to low risk gear, fish outside of the SAM area until it reopens and then move the non-low risk gear inside SAM.

The results of these scenario are the same as those presented under the PA. This occurs as a result of the analysis being conducted on an annual basis. That is, within an annual time frame, can a vessel absorb the cost of converting to low risk gear, continue to fish and earn profits?

Under the PA and this alternative, we conclude that all sink gillnet vessels are likely to choose scenario 1 since annual profits are reduced by a maximum of 2.0 percent. Class II and Class III lobster vessels in SAM are also likely to choose scenario 1. However, Class I lobster vessels in SAM are probably better off with scenario 3.

Vessels that can absorb the cost of converting their gear will not take the risk of losing their fishing territory. If a vessel chooses not to convert their gear, they incur the cost of removing and resetting their gear in another area, and the risk of losing their fishing ground within SAM. If lobster or fish catch rates are lower outside of SAM, these vessels will also incur a slight loss of revenues due to the catch rate differential. However, under this alternative, a loss of revenues due to the catch rate differential will be lower compared to the PA since the closure time is expected to be shorter.

5.4.3 Social Impacts

The social impacts of this alternative are similar to, but less burdensome, than those described in section 5.3.3. Initially restricting lobster trap and gillnet fishing within one SAM zone and gradually opening the area during the whales' seasonal migration would also affect more fishing vessels over a greater area (ca. 7,000 nm^2) for a longer period of time than the PA. Implementation of this alternative could result in unemployment if vessels cannot afford to modify their gear or are not able to relocate to other unrestricted areas. In addition, there may be negative impacts to the fishing community if more time is required to reach other fishing grounds because of extended separation from family, friends, and community. Alternatively, fishing effort may be shifted inshore, perhaps closer to family, friends, and community.

This alternative would create one SAM zone with initial fishing restrictions in place throughout the zone and sequentially openings as right whales move from west to east between March and July. Implementation of this alternative would be likely to reduce the potential for serious injury and mortality to right whales from entanglements. Therefore, there wold be a reduction in the potential for extinction of right whales, which has a positive social benefit by protecting a critically endangered species and preserving overall marine biodiversity. However, implementation of this alternative presents significant operational and logistical problems because it requires almost constant monitoring and surveillance, which may not be possible due to resource limitations.

5.5 NO INITIAL GEAR RESTRICTIONS, BUT WITH RESTRICTIONS PUT IN PLACE AS RIGHT WHALE CONCENTRATIONS APPEAR IN THE AREA AND THEN LIFTED AS RIGHT WHALE CONCENTRATIONS LEAVE THE AREA

This alternative would implement a single SAM zone based on the description in section 3.1 with no initial gear restrictions required

until concentrations of right whales begin to appear in the area and then lifted as the animals leave the area.

5.5.1 Biological Impacts

This alternative is the exact opposite of the one described in section 5.4 because the SAM zone would have no initial gear restrictions required until concentrations of right whales are sighted in the area, which would then be lifted as the animals leave the area. The analysis of the aerial surveys found that, during the 3 years data was collected, right whales consistently migrated across the core SAM area from west to east between the months of March and July. Therefore, this alternative acknowledges and responds to the most recent scientific study of right whale distribution and abundance in the Gulf of Maine. However, although having no initial restrictions within the SAM zone would make this alternative potentially the least burdensome management option, implementation of this alternative presents significant logistical difficulties inherent in the regular monitoring and surveillance of right whales over such a large area.

5.5.2 Economic Impacts of Non-Preferred Alternative 3 (NPA 3)

Under this alternative, the proposed area will close when right whales migrate into the area and lifted as right whales migrate out of the area. For example in SAM West, if right whales become present March 15 and leave April 15, the closure will start March 15 and end April 15. Under the preferred-alternative (PA), the SAM West closure starts March 1 and ends April 31, independent of when right whales arrive into the area. Under this alternative, aerial surveys are required to determine whether right whales are present in the proposed closure.

Three potential scenarios considered as to how the fishing industry may react to this alternative include: 1) convert to low risk gear and continue fishing in SAM; 2) do not convert to low risk gear and choose not to fish during this time period; or 3) do not convert to low risk gear, fish outside of the SAM area until it reopens and then move the non-low risk gear inside SAM.

The results of these scenarios are the same as those presented under the PA. This occurs as a result of the analysis being conducted on an annual basis. That is, within an annual time frame, can a vessel absorb the cost of converting to low risk gear, continue to fish and earn profits?

Under the PA and this alternative, we conclude that all sink gillnet vessels are likely to choose scenario 1 since annual profits are reduced by a maximum of 2.0 percent. Class II and Class III lobster vessels in SAM are also likely to choose scenario 1. However, Class I lobster vessels in SAM are probably better off with scenario 3.

Vessels that can absorb the cost of converting their gear will not take the risk of losing their fishing territory. If a vessel chooses not to convert their gear, they incur the cost of removing and

resetting their gear in another area, and the risk of losing their fishing ground within SAM. If lobster or fish catch rates are lower outside of SAM, these vessels will also incur a slight loss of revenues due to the catch rate differential. However, under this alternative, a loss of revenues due to the catch rate differential will be lower compared to the PA (Section 5.2.2) and NPA 2 (Section 5.4.2) since the closure time may be the shortest under this alternative.

5.5.3 Social Impacts

The social impacts of this alternative are similar to, but less burdensome, than those described in sections 5.4.3 and 5.3.3. Initially having no restrictions on lobster trap and gillnet fishing within one SAM zone and then gradually closing the area when right whales are sighted during their seasonal migration could potentially affect fewer fishing vessels over a smaller area for a shorter period of time than the PA. However, implementation of this alternative could result in unemployment if vessels cannot afford to modify their gear or are not able to relocate to other unrestricted areas. In addition, there may be negative impacts to the fishing community if more time is required to reach other fishing grounds because of extended separation from family, friends, and community. Alternatively, fishing effort may be shifted inshore, perhaps closer to family, friends, and community.

This alternative would create one SAM zone with no initial fishing restrictions in place throughout the zone and gradual implementation of restrictions as right whales are sighted moving from west to east between March and July. Implementation of this alternative would be likely to reduce the potential for serious injury and mortality to right whales from entanglements. Therefore, there wold be a reduction in the potential for extinction of right whales, which has a positive social benefit by protecting a critically endangered species and preserving overall marine biodiversity. However, implementation of this alternative presents significant operational and logistical problems because it requires almost constant monitoring and surveillance, which may not be possible due to resource limitations.

6.0 POTENTIAL CUMULATIVE EFFECTS

This section estimates the cumulative effects of several preferred alternative plans proposed or implemented with the intention of protecting right whales. Three types of plans exist. First, gear modifications have been required under 3 PA plans (NMFS 1997; NMFS 2000; NMFS 2001). Dynamic Area Management (DAM) is a second plan. Under DAM, a sighting of 3 right whales at a density of 0.04 right whales per square nautical mile would trigger a closure to all lobster and sink gillnet gear. A SAM zone is the third plan which is proposed here. See Section 8.1 (*Right Whale Management*) for an explanation of the overall strategy of these plans.

The SAM regulation has been proposed after the Gear and DAM regulations were proposed in 2001. To assess the cumulative effects of SAM, we need to first adjust the cumulative effects of DAM. In the DAM rule, we assumed vessels would not fish during the closure and there would be a loss due to forgone revenues and the cost of moving the gear out of DAM and back into DAM. The total industry cost for DAM for the lobster and sink gillnet fleet was $3,168K and $2,679K, respectively. As noted earlier, SAM encompasses 4 of the 6 DAM closures, and 1 of the closures is in Canadian waters (Area 5). Excluding Area 5, SAM encompasses all areas of DAM except area 8. Therefore the total cost of DAM for the lobster and sink gillnet fleet is adjusted to $325K and $275K, respectively (Table 6.0).

The lower and upper bound annual cumulative effects for both fleets are $2,173.3K and $5,933.3K, respectively (Table 6.1). These cumulative effects are lower than the cumulative effects prior to this SAM rule. That is the lower and upper bound effects for both fleets prior to SAM were $7,224K and $10,785K, respectively. In the DAM analysis we assumed all vessels would not fish and therefore the total cost was forgone revenues. However, after further investigation of SAM, we concluded that the majority of the vessels can absorb the cost of converting to low risk gear, continue to fish and earn profits. The cost of converting the gear is less than total forgone revenues for these vessels. That is the reason the cumulative industry effects with SAM are lower, compared to the cumulative effects without SAM.

Finally the lower and upper bound annual cumulative effects for the lobster fleet including SAM, are $1,647K and $5,375K, respectively. The lower and upper bound annual cumulative effects for the sink gillnet fleet are $526.3K and $558.3K, respectively.

7.0 FINDING OF NO SIGNIFICANT IMPACT

Impacts to society, both beneficial and adverse, were evaluated in this document and were determined to not be significant. Implementation of SAM, as described in this document, is expected to have relatively short-term, site-specific negative impacts on the fishing industry by regulating fishing gear during the designated periods for SAM or by requiring fishermen to move to alternative unrestricted fishing grounds. SAM is also expected to have positive effects on right whales by reducing the risk of serious injury and mortality from entanglements. The impact of SAM alone, however, is not significant enough to avoid the likelihood of jeopardy.

Public health and safety is not expected to be significantly affected by the implementation of SAM. Regulating fishing gear within SAM zones during the designated periods could result in fishermen being dislocated to unrestricted areas in order to continue fishing with gear not configured for fishing within SAM. Access to these unrestricted areas may require traveling further from home ports, which may expose fishermen to greater risk. Alternatively, fishing effort may become relocated closer to shore, which may present less risk. There is no evidence, however, that requiring modified fishing

gear in the SAM zones will result in significant impacts to public health and/or safety.

The two geographic areas NMFS has defined for SAM extend from the waters off Cape Cod to the Exclusive Economic Zone line and include the northern edge of Georges Bank. These areas were found to be candidates for restrictions based on the predicable annual presence of right whales. While these areas are valuable in spatial and temporal characteristics which are beneficial for right whale recovery and protection, these geographic areas do not have unique characteristics. There is no evidence that SAM zones would have unique geographic characteristics.

The effects on the human environment from SAM are not likely to he highly controversial. The impact of SAM may be controversial to a small segment of the fishing community, but the overall effects on the human environment are not expected to be highly controversial. The SAM zones have pre-established boundaries and their closing and opening dates are specified in advance of the expected arrival of right whales to the area. This approach is very similar to the management program established in the existing Cape Cod Bay and Great South Channel restricted areas. Therefore, the defined boundaries of SAM, pre-established dates for restrictions, and similarity to other management programs limits the scope of the effects on the human environment.

While the time and area of SAM zones has been determined, it is impossible to identify the exact individuals likely to be affected by this interim final rule. However, enough information exists which indicates that effects cannot be characterized as highly uncertain. The analysis in this EA uses previous sighting data to predict the time and location for SAM zones. This analysis provides sufficient information and insight into the potential effects associated with the implementation of SAM in future years. The implementation of fishery restrictions based on the delineation of the two SAM zones is not expected to result in any unique or unknown risks. Restrictions on fishing areas or gear types are not unusual management tools and are already implemented in order to meet objectives of the Magnuson-Stevens Act, MMPA, and ESA.

There is no evidence that implementation of SAM as a management tool to reduce the risk of entanglement to right whales establishes a precedent for future actions with significant effects or represents a decision in principle about a future consideration. The justification for SAM can be found in the BOs drafted for the multispecies, monkfish, spiny dogfish and lobster fisheries. The use of SAM as a management tool has been determined to be important in order for the agency to meet objectives under the MMPA and ESA. It is an independent action being implemented to achieve a specific objective and is therefore not expected to establish a precedent for future actions.

Section 6.0 of the EA examines the cumulative effects of this interim

final rule and two other proposed rules which establish criteria and procedures for implementing DAM and implement additional gear modifications also designed to reduce the risk posed to right whales from gillnet and lobster trap gear. Based on the information presented, it does not appear that these actions, occurring nearly simultaneously, and which have independently been determined to individually have insignificant impacts on society, will result in cumulatively significant impacts.

There is no evidence that the implementation of SAM will adversely affect entities listed in or eligible for listing in the National Register of Historic Places or will cause loss or destruction of significant scientific, cultural, or historic resources. The result of SAM will be temporary site specific restrictions on fishing practices. Compliance with these restrictions is, by definition, not likely to result in the permanent loss or destruction of resources.

The basis for this proposed action is to offer additional protection to the critically endangered right whale. It is expected that other protected marine mammals, to the extent their distribution and abundance coincides with concentrations of right whales, will benefit from the imposition of SAM. There is no evidence that threatened or endangered species will be adversely affected by SAM. Similarly, there is no evidence that implementation of SAM is likely to result in a violation of a Federal, state or local law for environmental protection. In fact, SAM would be expected to support Federal, state and local laws for environmental protection because it is expected that their goals and objectives would be similar to those of the MMPA and ESA. The implementation of SAM would not result in any actions that would be expected to result in the introduction or spread of a nonindigenous species.

In view of the analysis presented in this document, it is hereby determined that the implementation of SAM, as described in section 3.1 of this document, will not significantly affect the quality of the human environment with specific reference to the criteria contained in NAO 216-6 implementing the National Environmental Policy Act. Accordingly, the preparation of an Environmental Impact Statement for this proposed action is unnecessary.

Rebecca Lent

Rebecca Lent, Ph.D.
Assistant Administrator for Fisheries
National Marine Fisheries Service

12/28/01
Date

8.0 Regulatory Impact Review (RIR)

8.1 Executive Order (E.O.) 12866

The RIR is intended to assist NMFS decision making by selecting the regulatory action that maximizes net benefits to the Nation.

Right Whale Management
Several measures have been implemented by the National Marine Fisheries Service to reduce and eliminate entanglement mortality of right whales. The proposed action will reduce right whale entanglements further. The sum of these regulations represent a right whale program, and each regulation provides a different level of protection. The closure of CCBCH (from January 1 to May 15) and GSCCH (from April 1 to June 30) to lobster and sink gillnet gear provides the highest level of protection to right whales (FR July 22, 1997, 50 CFR Part 229). [19] Dynamic Area Management (FR December 2001, 50 CFR Part 229) potentially provides an equal level of protection. In DAM, a sighting of 3 or more right whales outside of existing closure at a density of 0.04 right whales per square nautical mile or greater, will trigger a closure to all lobster and sink gillnet gear. The proposed action SAM, will provide a lower level of protection. Based on 1999 and 2000 right whale sightings data (Merrick, et.al., 2001), areas with large concentrations of right whales (excluding CCBCH and GSCCH) have been identified and used to develop the temporal and spatial boundaries of SAM. Sink gillnet and lobster vessels are allowed to fish in SAM if they modify to low risk gear explained within the SAM PA. Although we expect the gear modifications to be successful in eliminating right whale entanglements, the level of protection is still reduced since it is unknown whether the gear modifications will be successful at this point in time. Gear regulations published in 1997, 2000 and 2001 (FR July 22, 1997; FR December 21, 2000), provide the lowest level of protection since the requirements are less than those required to fish within SAM. However these gear regulations protect right whale in areas outside of the CCBCH, GSCCH, DAM and SAM, and are considered a significant part of the right whale program.

The gear regulation, restricted and complete closures have been developed over several years in support of the Atlantic Large Whale Take Reduction Team (ALWTRT). This proposed regulation, SAM, has been proposed after DAM. In the final DAM EA, 6 potential DAM closures were identified based on 2000 right whale sightings data. The economic impact of closing these six areas was assessed. These same 2000 right whale sightings data were used to design the spatial and temporal boundaries of SAM. SAM encompasses 4 of the 6 DAM areas. Therefore, the economic impacts assessed in DAM are overestimated since they are a subset of the SAM closure.

---

[19] The 1997 regulation does allow lobster gear in the CCBCH if sinking line is used on all buoy and ground lines. This modification does reduce the level of protection.

In addition to right whale management, sink gillnet vessels are regulated under dogfish, monkfish and groundfish plans. Vessels may have additional fishing restriction under these plans. As a result, right whale management may in fact not incur any extra cost since these vessels may be restricted to fish in SAM and/or DAM areas under these other plans.

Framework for Analysis
Net National benefit is measured through economic surpluses, consumer and producer surplus. Within this setting, consumer surplus is associated with the value of right whales and the consumer surplus associated with seafood products supplied by the lobster and gillnet fisheries. The value of right whale protection is comprised of non-consumptive use and non-use values. Non-consumptive use value is associated with activities such as whale watching while non-use value is associated with the satisfaction that people derive from knowing that right whales exist. Producer surplus is associated with the economic profit earned by businesses engaged in the lobster and gillnet fisheries as well as that earned by businesses providing transportation services to individuals that want to view right whales.

When comparing a regulatory action to the status quo or "no action" alternative, it is the change in net National benefit that becomes the focal point of analysis. Given the finding that the status quo alternative does not afford adequate protection, the consumer surplus (non-consumptive use and non-use value) associated with improved right whale protection will be superior to that of the status quo. Further, regulatory alternatives that afford higher protection will yield higher benefits at the margin.

All four of the alternatives involve restricting lobster and sink gillnet fishing in the SAM zone. Under all four alternatives vessels can fish in the area if they convert to low risk gear. Time and space define the differences between the alternatives. Specifically, the PA closes SAM West from March 1 to April 31, and SAM East is closed from May 1 to July 31. Under non-preferred alternative 1 (NPA 1), SAM East and SAM West are closed from March 1 to July 31. The closure time is increased under NPA 1, compared to the PA. The non-preferred alternative 2 is slightly different in comparison to the PA and NPA 1. Given the inter-annual variability in the arrival of right whales to an area, this alternative suggests closing an area when the right whales appear. For example, under SAM West PA, the closure is scheduled for March 1. Under NPA2, if the right whales are first seen in SAM West on March 15, then the closure starts March 15. This alternative requires additional funds to support aerial surveys to detect when the right whales are in the proposed closure. The non-preferred alternative 3 (NPA 3) plan, is slightly different compared to NPA 2. This alternative includes everything under the NPA 2 plan, plus it suggests opening the closure early if the right whales move out of the area early. Under this plan (NPA 3), more aerial survey time is needed to detect when the animals leave.

The absolute magnitude of right whale protection provided by these regulatory alternatives can not be quantified, but they can be ranked. Non-preferred alternative 1 (NPA 1) provides the greatest protection to right whales, followed by the PA. Non-preferred alternative 2 and 3 provide the least protection to right whales. The reasoning is as follows. Under non-preferred alternative 2 and 3 (NPA 2 and NPA 3), gear is in the water when the right whales are present. That is, vessels that choose not to convert their gear must now remove it during a time the right whales are present. It can take up to a week to remove all gear from an area. In addition, these two alternatives are dependent on aerial surveys which are dependent on weather. There have been situations where flights were canceled for three weeks due to bad weather. The right whales may be there, but we may not be able to determine their presence due to bad weather. Therefore, the risk of entanglement is present and greater under NPA 2 and NPA 3, compared to the other alternatives. Under both the PA and NPA 1, vessels have advance notice to remove their gear out of the area if they choose not to convert to low risk gear. The PA is less protective compared to the NPA 1 plan since the PA closes the area for shorter time compared to NPA 1.

Both consumer surplus and producer surplus for seafood products supplied by the lobster and gillnet fisheries will be affected by these right whale protection measures. These effects will manifest themselves through the proposed gear modification costs and closures. Gear modifications will increase harvesting costs which may result in a reduction in quantities supplied to seafood market and higher prices to consumers. If a vessel chooses not to modify their gear, the proposed closures will decrease earned revenues which will also result in a reduction in quantities supplied to seafood markets and higher prices to consumers. The magnitude of these changes and how the surpluses will be redistributed between consumers and producers will depend on the slopes of the respective supply and demand functions. In any case, as long as demand functions are downward sloping and supply functions are upward sloping, there is always a loss in economic surplus when regulatory costs are imposed. However, this loss in economic surplus will be minimized by selecting the least costly regulatory alternative which provides the maximum protection.

8.2 Regulatory cost to Lobster and Sink Gillnet Fleets for SAM

Under 4 alternatives, excluding status quo, vessels must convert to low risk entanglement gear to fish in the SAM zone. The following five alternatives are evaluated: 1) close SAM West from March 1 to April 30 and close SAM East from May 1 to July 31; 2) status quo or no action; 3) close SAM East and SAM West from March 1 to July 31; 4) SAM West and SAM East from March 1 open the area sequentially over time as concentrations of right whales move across the zone from west to east; and 5) close SAM East and West when right whales migrate into the area, and open SAM East and SAM West when right whales move out of the

area. The last two alternatives require aerial survey time to monitor the proposed area.[20]

Several potential scenarios exist as to how the fishing industry may adapt to this proposed action. The scenarios include: 1) convert to low risk gear and continue fishing in SAM; 2) choose not to fish or convert to low risk gear; or 3) fish outside of the SAM area, do no convert to low risk gear, and move gear back into SAM when it reopens.

In this section we discuss the economic impact on an individual vessel in Section 8.2.1. In section 8.2.2 industry impacts are presented followed by the cumulative effects of this proposed regulations with preceding regulations (Section 8.2.3)

8.2.1 Small Entity Impacts

Economic impacts on a individual vessels are evaluated here. We investigate whether a vessel can absorb the cost of converting to low risk gear, continue to fish and earn profits. Since these type of decisions are based on an annual time frame, we estimate a vessel's annual revenues, variable and fixed expenses, and labor to determine their profits on average. Next we measure their profit change given they incur the cost of converting their gear. In addition, a break even analysis is performed for lobster vessels, where the break-even quantity represents the pounds of lobster a vessel must land to start making a profit. If the break-even quantity is negative, vessels will go out of business.

Vessels are divided into length classes. In the lobster fleet we define the following three length classes: 1) Class I vessels are 35 feet or less; 2) Class II lobster vessels are between 36 and 49 feet; and 4) Class III lobster vessels are 50 feet or greater. In the sink gillnet we have the following two length classes: 1) Class I sink gillnet vessels less than 40 feet; and 2) Class II vessels 40 feet and greater.

We estimate a lower and upper bound cost of converting to low risk gear by vessels class for the lobster and sink gillnet fishery. In the lobster fishery, the lower bound estimate represents the average amount of gear fished according to fishing records in the 2000 Vessel Trip Report (VTR) logbook. The upper bound estimate represents the gear conversion cost given a vessel fishes the legal maximum amount of traps. For example, lobster vessels fishing offshore exclusively can fish 1800 traps and vessels fishing all other areas can fish a maximum of 800 traps. In the sink gillnet fishery, a point estimate of gear fished is also estimated from the 2000 VTR logbook. The lower bound

[20] To determine the presence of right whales with confidence, approximately 3 flights a week would be required. To monitor SAM East (May 1 to July 31) and SAM West (March 1 to April 30), a total of 60 flights are needed at a total cost of $168,471, assuming one flight costs $2,808 per day.

gear conversion cost is based on a vessel using a lower cost 1100 pound weak link (1/4" polyester rope at $0.073). The upper bound estimate is based on a sink gillnet vessel choosing a break-away float (with a unit cost of $3.00), which is a new product targeted for 2002 production. We assume vessels will take a 3 year loan at 8.5 percent to pay for the up front cost of converting their gear.

Annual loan payments range between a low of $295 for a Class I sink gillnet vessel to a high of $28,902 for a Class III lobster vessel (Table 8.2.1). In general, the cost of converting to low risk gear is significantly lower for a sink gillnet vessel compared to a lobster vessel. This is due to the high material cost of a lobster vessel converting all ground and buoy lines to neutrally buoyant line. Gear conversion costs are the same under all alternatives.

Under all alternatives, sink gillnet vessels may absorb the cost of converting to low risk gear, continue to fish and earn profits. Profits for a sink gillnet vessel are reduced by a minimum of 0.3 percent (lower bound Class I) and a maximum of 2.2 percent (upper bound Class II) under the PA. Under the non-preferred alternative 1 (NPA 1), SAM East and West closed from March through July, sink gillnet vessel profits are reduced by a minimum of 0.4 percent (lower bound Class I) and a maximum of 2.0 percent (upper bound Class II).

In the lobster fishery, vessel profits are reduced from a minimum of 4.0 percent (lower bound Class III) to a maximum of 48.8 percent (upper bound Class I) under the PA. It may not be cost effective for Class I lobster vessels to incur the gear conversion cost. They may be better off choosing not to fish or fishing elsewhere. Class III vessels under the PA also have significant reductions in profits, however they are still profitable and their break even quantity was positive (ie. the break even quantity was less than their landings). Under non-preferred alternative 1 (NPA 1), SAM East and West closed from March through July, vessel profits were reduced by a minimum of 1.0 percent (lower bound Class II) and a maximum of 65 percent (upper bound Class I). Vessels in Class II and III can absorb the gear conversion cost, continue to fish and earn profits. As in the PA, Class I vessels under NPA1, may be better off choosing to fish elsewhere or not to fish at all.

The last 2 alternatives have results similar to the PA. Results are similar because the decision of whether a vessel can absorb the gear conversion cost is within an annual time frame. We expect these last two alternatives, to have lower revenue losses if a vessel chooses not to convert their gear since the time of the closure is expected to be shorter.

8.2.2 Industry Impacts

Under the PA, 49 vessels were affected, of which18 were lobster vessels and 31 were sink gillnet vessels (Table 8.2.2). Under NPA 1, SAM East and West closed March to July, 253 vessels were affected of which 193 were lobster and 60 were sink gillnet vessels. The total

lower bound industry costs for both fleets under the PA and NPA1 are $194.1K (=$194.1K+$1.9K) and $1,338.4K (=$398.8K+$939.6K), respectively. The total upper bound industry costs for both fleets under the PA and NPA1 are $387.2K (=$385.3K + $1.9K) and $1,894.2K (=$854.6K+$1,894.3K), respectively. These estimates assume Class I lobster vessels will not convert their gear.

Under the PA, forgone revenues for 7 Class I lobster vessels totaled $1,869 assuming they chose not to fish (Table 8.2.2). Under NPA 1, forgone revenues for 108 Class I lobster vessels totaled $939.6K. Forgone revenues are added to the gear conversion costs to determine total industry costs.

The lower bound industry costs for both fleets under the PA and NPA1 for converting to low risk gear are $194.1K ($398,8K for 3 years) and $398.8K ($1,196.3K for 3 years), respectively (Table 8.2.2). The upper bound industry costs for both fleets under the PA and NPA1 for converting to low risk gear are $385.3K ($854.6K for 3 years) and $854.6K ($2,563.9K for 3 years), respectively. These estimates assume Class I lobster vessels will not convert their gear.

Lobster Fleet
The total lower bound industry costs for the lobster fleet under the PA and NPA1 are $153.1K (=$151.2K+$1.9K) and $1,263.1K (=$323.5K+$939.6K), respectively (Table 8.2.2). The total upper bound industry costs for both fleets under the PA and NPA1 are $319.8K (=$317.9K + $1.9K) and $2,630.4K (=$736.1.6K+$1,894.3K), respectively. These estimates assume Class I lobster vessels will not convert their gear.

Sink Gillnet Fleet
The total lower bound industry costs for the sink gillnet fleet under the PA and NPA1 are $43.0K and $75.3K, respectively (Table 8.2.2). The total upper bound industry costs for both fleets under the PA and NPA1 are $67.4K and $118.5K, respectively.

8.3 Final Regulatory Flexibility Analysis

The objective of this proposed rule is to reduce the level of serious injury to and mortality of North Atlantic right whales in the East Coast lobster trap and sink gillnet fishery. This PA allows vessels to fish in the SAM zone if they convert to low risk gear. We evaluate within an annual time frame, whether a vessel can absorb the cost of converting to low risk gear, continue to fish and earn profits.

This proposed rule effects 49 vessels, of which 18 vessels fish lobster gear and 31 vessels fish sink gillnet gear. In the lobster fishery, vessel profits (not revenues) are reduced from a minimum of 4.0 percent to a maximum of 48.8 percent. There are 11 lobster vessels that will likely absorb this gear conversion cost, continue to fish and earn profits. However, it may not be cost effective for 7 lobster vessels to convert to low risk gear. In this case we assume they will not fish at all, though in reality there are likely some short term

alternatives. In the sink gillnet fishery, vessel profits are reduced from a minimum of 0.3 percent to a maximum of 2.2 percent. Based on these results, sink gillnet vessels would also likely absorb the gear conversion cost and continue to earn profits. For more details on the individual vessel, see the Small Entity Impacts section (Section 8.2.1). For the complete analysis see the Economic sections under each alternative under 5.0 above.

In addition to this proposed rule, a gear rule (NMFS, 2001) and a Dynamic Area Management (DAM) rule are also being proposed. It is important to consider the cumulative (and simultaneous) impacts of these regulations on the individual vessel. Under the gear rule, the impacts on individual vessels is considered insignificant (see Draft EA of the Final Rule amending the ALWTRP - Gear Modifications 11/2001). The economic impact of the DAM system has now been modified since the analysis of this proposed rule. Specifically, the SAM zone encompasses 4 of the 6 proposed DAM areas. One of the DAM areas is in Canadian waters.

The continuing economic impact of DAM now applies to only one area and for a time frame of 2.5 weeks in a given year: the closure from June 20 to July 6, north of the SAM zone on Cashes Ledge. If a vessel chose not to fish at all during this closure, their revenues would be reduced by roughly 12.5 percent, assuming a 20 week season. While some vessels may continue to fish and earn profits, this revenue reduction (-12.5 percent) may be considered significant.

NMFS considered but rejected a no action alternative that would result in no changes to the current measures under the ALWTRP. The no action alternative would result in no additional economic burden on the fishing industry, at least in the short-term. However, if the status quo is maintained now, more restrictive and economically burdensome measures than those in this rule may be necessary in the future to protect endangered right whales from the fisheries. The no action alternative was rejected because it would not enable NMFS to meet the RPA measures of the BO required under the ESA.

NMFS considered but rejected an alternative that would implement one SAM zone comprised of the two separate SAM zones with gear restrictions throughout the designated time frame. From the data collected during the 3 years of aerial surveys, it was determined that the core SAM area, in combination with the existing Cape Cod Bay and Great South Channel Restricted Areas, encompassed 134 (90 percent) of the 149 events from 1999-2001. The analysis of this data also led to the finding that, within the core SAM area, right whale events occur more frequently in the western part of the zone (near Cape Cod Bay and the Great South Channel) in March-April than in June-July. For example, 13 of the 15 events outside of the Cape Cod Bay and Great South Channel Restricted Areas occurred in the area NMFS has defined as SAM West, which lies west of 69E 24' W longitude.

Conversely, during May-July, all of the events within the area defined as SAM East, which were not in the Great South Channel Restricted

Area, were east of 69E 24' W longitude. This analysis strongly suggests that right whales migrate from west to east within the SAM core area between the months of March and July. Therefore, NMFS does not believe that the scientific data supported a single SAM zone covering the entire area for the duration of the 5 month period.

NMFS considered but rejected an alternative that would implement a single SAM zone based on gear restrictions initially required throughout the zone, but lifted sequentially over time as concentrations of right whales move across the zone from west to east. This alternative is similar to the one described in section 5.3 with the only difference being the sequential lifting of gear restrictions as right whales migrate across the SAM zone from west to east instead of maintaining gear restrictions for the 5 month duration of the SAM zone. The analysis of the aerial surveys found that, during the 3 years data was collected, right whales consistently migrated across the core SAM area from west to east between the months of March and July. Therefore, this alternative acknowledges and responds to the most recent scientific study of right whale distribution and abundance in the Gulf of Maine.

However, although sequential openings would make this alternative somewhat less burdensome than sustaining restrictions over the entire area for a 5 month period, implementation of this alternative presents significant logistical difficulties inherent in the regular monitoring and surveillance of right whales over such a large area.

NMFS considered but rejected an alternative that would implement a single SAM zone based on the same criteria as the PA with no initial gear restrictions required until concentrations of right whales begin to appear in the area and then lifted as the animals leave the area. Under this alternative, it would be extremely difficult if not impossible to monitor right whale movements and inform industry of implementing or lifting restrictions within an area.

The PA would protect predictable annual congregations of North Atlantic right whales in the waters off Cape Cod and out to the Exclusive Economic Zone line. NMFS has defined two areas (SAM East and SAM West), which gear restrictions for lobster trap and anchored gillnet gear are required. These requirements are more stringent than, and in addition to, the gear modifications currently required under the ALWTRP for the Offshore Lobster Waters, Northern Nearshore Lobster Waters, Northern Inshore Lobster Waters and Other Northeast Waters (gillnet area description).

The time/area restrictions are based on the annual predictable presence of North Atlantic right whales as observed in aerial surveys from 1999-2001. SAM West will occur on an annual basis for the period March 1 - April 30. SAM East will occur on an annual basis for the period May 1 - July 31. NMFS accepted this alternative as these gear modifications are necessary to avoid jeopardizing the continued existence of North Atlantic right whales and enable NMFS to meet a portion of the RPA in the BOs.

9.0 APPLICABLE LAW

9.1 National Environmental Policy Act

NMFS prepared this EA in accordance with the National Environmental Policy Act.

9.2 Endangered Species Act

A BO on the three Fishery Management Plans (FMP) for the monkfish, spiny dogfish, and multispecies fisheries, and the Federal regulations for the lobster fishery was issued on June 14, 2001. The BO concluded that the FMPs and lobster regulations jeopardize the continued existence of right whales. Therefore, NMFS defined a Reasonable and Prudent Alternative (RPA) with multiple management components to the proposed action. Among the RPA elements was a mechanism for the regulation of lobster trap and anchored gillnet fishing gear in areas outside designated right whale critical habitat based on predictable annual concentrations of right whales, which NMFS has termed Seasonal Area Management (SAM). The proposed action is intended to implement the SAM element of the RPA

9.3 Marine Mammal Protection Act

The PA to implement SAM will not adversely affect marine mammals because the purpose of the interim final rule is to reduce the risk of entanglement of right whales in lobster trap gear and gillnet fishing gear.

9.4 Paperwork Reduction Act

This proposed action does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

9.5 Essential Fish Habitat

The area affected by the proposed action has been identified as Essential Fish Habitat (EFH) for species in the Northeast groundfish, sea scallops, monkfish, and spiny dogfish FMPs. This proposed action may have an adverse impact on EFH. Because the potential adverse impact on EFH is not substantial, NMFS conducted an abbreviated EFH consultation pursuant to 50 CFR 600.920(h) and prepared an EFH Assessment on December 19, 2001, that incorporates all of the information required in 50 CFR 600.920(g)(2). No EFH consultation recommendations resulted from that consultation process.

10.0 TABLES

Table 5.1.2.1
General lobster gear information with unit material and labor costs to estimate the cost of converting to low risk gear.

Gear Information	Variable Name	N.Nearshore (Class I and II)		N.Offshore Class III	
		LB	UB	LB	UB
Number of Traps	NT	266	800	854	1800
Number of Trawls	NTR	17.7	53.3	21.4	45
Length of Line Between Traps	LLBT	120	120	180	180
Depth of Water	DOW	177	177	419	419
Material Costs	**Variable Name**	**$/unit**			
1500 lb Weak Link	WL				
1/4" Polyester Rope (3 feet)		0.073			
Plastic Swivel		2.50			
Neutrally Buoyant Line (At 1 foot)	NB				
Nearshore - 3/8"		0.06			
Offshore - 5/8"		0.211			
Labor Costs	**Variable Name**				
Time to Measure 100'	TTM	2 min.			
Attach a Weak Link	TAWL	10 min.			
U.S.Bureau Labor Rate per hour	$LR	$14.05			

Table 5.1.2.2
Cost per vessel to convert to low risk gear

Gear Change	Cost of	N.Nearshore ($1) (Class I and II)		N.Offshore ($1) (Class III)	
		LB	UB	LB	UB
NB on BL	Material	282	849	2,833	5,957
	Labor	22	66	63	133
	Vessel Total	304	915	2,896	6,090
NB on GL	Material	1,912	5,757	32,511	68,364
	Labor	149	449	722	1,517
	Vessel Total	2,061	6,206	33,233	69,881
Weak Link	Material	45	137	56	116
	Labor	83	250	100	211
	Vessel Total	128	387	156	327
Grand Total	Vessel Total	2,493	7,508	36,285	76,298

Table 5.1.2.3.
Variable and Fixed expenses of SAM East Class III lobster vessels (PA)

Variable Expenses	Year 2000
Boat Repair and Maintenance - By Yard	20,831
Boat Repair and Maintenance - By Owner	10,416
Supplies (Store)	6,249
Food	18,748
Gear Maintenance (Normal Use)	20,831
Fuel and Lubricants	36,455
Bait	72,909
Vehicles	9,374
Sternman Payment	156,234
Sales and taxes	
Total	352,047
Fixed Expenses	**2000**
Licence and Permits	573
Mooring & Docking Fees	3,489
Interest on Loans (Operating)	521
Interest on Loans (Long Term)	14,061
Insurance (Boat)	17,394
Insurance (Sternman)	20,310
Property Taxes	469
Losses of Gear and Equipment	19,113
Fixed Cost on Shore front Property	
Total	75,930

Table 5.1.2.4.
Break Even analysis of SAM East Class III lobster vessels (PA)

BE Components	Unit	Before Regulation	PA LB	PA UB
Price	$	4	4	4
VC/unit	$	2.03	2.03	2.03
Fixed (FC)	$	75,930	89,675	104,832
BE Units	pounds	38,556	45,535	53,232
Percent Increase			(+18%)	(+38%)

Revenue and Lobster Landings				
		Annual	SAM East	
Revenue	$	770,050	166,400	
Cost	$	427,978		
Profits	$	342,072		
Profit %	LB	(-4.0%)		
Reduction	UB	(-8.5%)		
Landings	pounds	173,368	34,600	

Table 5.1.2.5.
Variable and Fixed Expenses for SAM West Class I lobster vessels

Variable Expenses	Year
	2000
Boat Repair and Maintenance - By Yard	336
Boat Repair and Maintenance - By Owner	882
Supplies (Store)	576
Food	256
Gear Maintenance (Normal Use)	1,153
Fuel and Lubricants	1,159
Bait	3,378
Vehicles	906
Sternman Payment	4,894
Total	13,540
Fixed Expenses	**2000**
Licence and Permits	208
Mooring & Docking Fees	989
Interest on Loans (Operating)	782
Interest on Loans (Long Term)	2,045
Insurance (Boat)	641
Insurance (Sternman)	301
Property Taxes	341
Losses of Gear and Equipment	2,225
Fixed Cost on Shore front Property	1,510
Total	9,042

Table 5.1.2.6.
Variable and Fixed Expenses for SAM West Class III lobster vessels.

Variable Expenses	Year
	2000
Boat Repair and Maintenance - By Yard	9,972
Boat Repair and Maintenance - By Owner	4,986
Supplies (Store)	2,992
Food	8,975
Gear Maintenance (Normal Use)	9,972
Fuel and Lubricants	17,451
Bait	34,902
Vehicles	4,487
Sternman Payment	74,790
Total	168,527
Fixed Expenses	**2000**
Licence and Permits	573
Mooring & Docking Fees	3,489
Interest on Loans (Operating)	249
Interest on Loans (Long Term)	6,731
Insurance (Boat)	8,327
Insurance (Sternman)	9,723
Property Taxes	469
Losses of Gear and Equipment	9,149
Fixed Cost on Shore front Property	
Total	38,710

Table 5.1.2.7.
Break Even analysis of SAM West Class I lobster vessels (PA)

BE Components	Unit	Before Regulation	PA LB	PA UB
Price	$	4	4	4
VC/unit	$	1.91	1.91	1.91
Fixed (FC)	$	9,042	9,986	11,885
BE Units	pounds	4,320	4,771	5,679
Percent Increase			(+10%)	(+31%)

Revenue and Lobster Landings				
		Annual	SAM West	
Revenue	$	28,400	267	
Cost	$	22,582		
Profits	$	5,818		
Profit %	LB	16%		
Reduction	UB	49%		
Landings	pounds	7,100	67	

Table 5.1.2.8.
Break Even analysis of SAM West Class III lobster vessels (PA)

BE Components	Unit	Before Regulation	PA LB	PA UB
Price	$	4	4	4
VC/unit	$	2.24	2.24	2.24
Fixed (FC)	$	38,710	39,654	41,553
BE Units	pounds	21,970	22,506	23,584
Percent Increase			(+2.4%)	(+7.3%)

Revenue and Lobster Landings				
		Annual	SAM West	
Revenue	$	323,900	7,500	
Cost	$	207,237		
Profits	$	116,463		
Profit %	LB	1.0%		
Reduction	UB	2.4%		
Landings	pounds	75,300	900	

Table 5.1.2.9
General sink gillnet gear information and unit material and labor costs to estimate the cost of converting to low risk gear.

Gear Information	Variable Name	N.Nearshore (Class I)	N.Offshore (Class II)
Number of Strings	NS	4.8	10.7
Number of Net Panels	NNP	10.3	18.4
Height of Net Panel	HNP	10 feet	10 feet
Depth of Water	DOW	177 feet	419 feet
Length of Anchor Line	LAL	100 feet	100 feet
Material Costs	**Variable Name**	**$/unit**	
1100 lb Weak Link	WL		
1/4" Polyester Rope (3feet)		0.073	
3780 lb Weak Link			
7/16" polypropylene (3feet)		1.00	
Breakaway Float on panel		3.00	
Neutrally Buoyant Line	NB	0.04	
(@ 1 foot)			
Nearshore - 3/8"		0.06	
Offshore - 5/8"		0.211	
Labor Costs	**Variable Name**		
Time to Measure 100'	TTM	2 min.	
Attach a Weak Link	TAWL	10 min.	
U.S.Bureau Labor Rate	$LR	$14.05/hr	

Table 5.1.2.10
Total cost of converting to low risk gear per sink gillnet vessel.

Gear Item	Gear Change	Cost Type	N.Nearshore ($1) (Class I)	N.Offshore ($1) (Class II)
1	1100 lb WL on Net Panels, High Flyer and Ball	NWL per string	42.2	74.6
		Material	14.79	58.27
		Labor	474.33	1,869.17
		Vessel Total	489.12	1,927.44
2	NB Buoy Line	Material	76.49	1,418.96
		Labor	5.97	31.50
		Vessel Total	82.46	1,450.46
3	NB on Anchor & Ground Line	Material	66.24	519.27
		Labor	130.21	161.86
		Vessel Total	196.45	681.13
4	3780 lb WL on Buoy Line	Material	0.19	0.43
		Labor	11.24	25.06
		Vessel Total	11.43	25.49
Grand Total (1-4)		Vessel Total	779	4,085
5	Breakaway Float	Material	593	2,363
		Labor	474	1,869
		Vessel Total	1,067	4,232
Grand Total (2-5)		Vessel Total	1,357	6,389

Table 5.1.2.11
Annual cost of replacing webbing in net panels and replacing 1 string for the average sink gillnet vessel

Gear Descriptions	N.Nearshore (Class I)	N.Offshore (Class II)
Annual cost of replacing webbing	2,225	8,860
Replacement of 1 string		
Anchors - 2 danforth	134	134
High Flyer Flags - 2	110	110
Buoy Ball - 2	14	14
NB line on buoy line	16	133
NB line on anchor line	12	42
Headrope	515	920
Leadline	721	1,288
Webbing	463	828
Total	1,985	3,469
Annual gear replacement	4,210	12,329

Table 5.1.2.12
Break Even analysis of SAM East Class II sink gillnet vessels (PA)

Revenue and Lobster Landings			
		Annual	SAM East
Revenue	$	302,800	101,700
Variable and Fixed Costs	$	35,500	
Remaining Revenues	$	267,300	
Labor		133,650	
Profits		133,650	
Profit % Reduction	LB	(-1.2%)	
	UB	(-1.8%)	
Landings	pounds	238,600	86,500

Table 5.1.2.13.
Break Even analysis of SAM West Class I sink gillnet vessels (PA)

Revenue and Lobster Landings			
		Annual	SAM East
Revenue	$	210,900	72,300
Variable and Fixed Costs	$	17,900	
Remaining Revenues	$	193,000	
Labor		96,500	
Profits		96,500	
Profit % Reduction	LB	(-0.3%)	
	UB	(-0.5%)	
Landings	pounds	119,300	59,800

Table 5.1.2.14.
Break Even analysis of SAM West Class II sink gillnet vessels (PA)

Revenue and Lobster Landings			
		Annual	SAM East
Revenue	$	252,200	76,000
Variable and Fixed Costs	$	35,200	
Remaining Revenues	$	217,000	
Labor		108,500	
Profits		108,500	
Profit % Reduction	LB	(-1.4%)	
	UB	(-2.2%)	
Landings	pounds	180,600	76,000

Table 5.1.2.15
Summary of PA vessels, annual revenues, variable and fixed expenses and profits per vessels with out this regulation, annual gear payments and reduction of profits due this regulation (ie. gear conversion costs) per vessel by fleet and vessel length class.

	SAM East		SAM West			
	Lobster	Sink Gillnet	Lobster		Sink Gillnet	
	Class III	Class II	Class 1	Class III	Class I	Class II
Vessel Length in Feet	>50	> 40	< 35	> 50	< 40	> 40
Number of Vessels	7	20	7	4	4	7
Per Vessel						
Annual Revenues	770,050	302,800	28,400	323,900	210,900	252,200
Variable and Fixed Expenses	428,000	35,500	22,600	207,200	17,900	35,200
Profits w/out PA	342,050	133,650	5,800	116,700	96,500	108,500
Annual Gear Loan Payment						
LB	13,745	1,547	944	13,745	295	1,547
UB	28,902	2,420	2,833	28,902	514	2,420
Annual Profits Reduction						
LB	0.040	0.012	0.163	0.118	0.003	0.014
UB	0.084	0.018	0.488	0.248	0.005	0.022

Table 5.1.2.16
Summary of PA vessels, annual loan payments, industry cost of converting to low risk gear and forgone revenues by fleet and vessel length class

	SAM East		SAM West				Grand Total
	Lobster	Sink Gillnet	Lobster		Sink Gillnet		
	Class III	Class II	Class 1	Class III	Class I	Class II	
Vessel Length (Feet)	>50	> 40	< 35	> 50	< 40	> 40	
Number of Vessels	7	20	7	4	4	7	49
Annual Loan Payment							
LB	13,745	1,547	944	13,745	295	1,547	
UB	28,902	2,420	2,833	28,902	514	2,420	
Industry Total							
LB	96,215	30,940	0	54,980	1,180	10,829	194,144
UB	202,314	48,400	0	115608	2,056	16,940	385,318
Revenues in SAM			267				
Industry Forgone Revenues			1,869				

Table 5.3.2.1
Variable and Fixed Expenses for SAM East/West Class II lobster vessels.(NPA1)

Variable Expenses	Year 2000
Boat Repair and Maintenance - By Yard	615
Boat Repair and Maintenance - By Owner	1,956
Supplies (Store)	1,578
Food	759
Gear Maintenance (Normal Use)	2,276
Fuel and Lubricants	3,342
Bait	5,616
Vehicles	1,863
Sternman Payment	15,622
Total	33,627
Fixed Expenses	**2000**
Licence and Permits	161
Mooring & Docking Fees	1,638
Interest on Loans (Operating)	814
Interest on Loans (Long Term)	1,832
Insurance (Boat)	1,336
Insurance (Sternman)	407
Property Taxes	312
Losses of Gear and Equipment	3,830
Fixed Cost on Shore front Property	315
Total	10,645

Table 5.3.2.2
Break Even analysis of SAM East and West Class I lobster vessels (NPA 1)

BE Components	Unit	Before Regulation	PA LB	PA UB
Price	$	4	4	4
VC/unit	$	2.10	2.10	2.10
Fixed (FC)	$	9,984	10,928	12,827
BE Units	pounds	5,260	5,757	6,758
Percentage Increase			(+9%)	(+28%)

Revenue and Lobster Landings				
		Annual	SAM East/West	
Revenue	$	29,900	8,700	
Cost	$	25,537		
Profits	$	4,362		
Profit %	LB	22%		
Reduction	UB	65%		
Landings	pounds	7,400	2,174	

Table 5.3.2.3.
Break Even analysis of SAM East and West Class II lobster vessels (NPA 1)

BE Components	Unit	Before Regulation	PA LB	PA UB
Price	$	4	4	4
VC/unit	$	1.26	1.26	1.26
Fixed (FC)	$	10,645	11,589	13,488
BE Units	pounds	3,891	4,236	4,930
Percentage Increase			(+9%)	(+27%)

Revenue and Lobster Landings				
		Annual	SAM West	
Revenue	$	120,200	7,500	
Cost	$	44,272		
Profits	$	75,929		
Profit %	LB	1%		
Reduction	UB	4%		
Landings	pounds	26,600	900	

Table 5.3.2.4
Break Even analysis of SAM East and West Class III lobster vessels (NPA 1)

BE Components	Unit	Before Regulation	PA LB	PA UB
Price	$	4	4	4
VC/unit	$	2.07	2.07	2.07
Fixed (FC)	$	75,930	89,675	10,832
BE Units	pounds	39,410	46,544	54,410
Percentage Increase			(+18%)	(+38%)

Revenue and Lobster Landings				
		Annual	SAM West	
Revenue	$	740,900	177,300	
Cost	$	427,978		
Profits	$	312,922		
Profit % Reduction	LB	4%		
	UB	9%		
Landings	pounds	169,800	35,600	

Table 5.3.2.5.
Break Even analysis of SAM East/West Class I sink gillnet vessels (NPA 1)

Revenue and Lobster Landings			
		Annual	SAM East
Revenue	$	154,200	72,600
Variable and Fixed Costs	$	15,400	
Remaining Revenues	$	138,800	
Labor		69,400	
Profits		69,400	
Profit %	LB	(-0.4%)	
Reduction	UB	(-0.7%)	
Landings	pounds	129,600	70,200

Table 5.3.2.6.
Break Even analysis of SAM East/West Class II sink gillnet vessels (NPA 1)

Revenue and Lobster Landings			
		Annual	SAM East
Revenue	$	273,600	119,800
Variable and Fixed Costs	$	34,400	
Remaining Revenues	$	239,200	
Labor		119,600	
Profits		119,600	
Profit %	LB	(-1.3%)	
Reduction	UB	(-2.0%)	
Landings	pounds	210,800	101,500

Table 5.3.2.7
Summary of the number of effected vessels, average revenues, variable and fixed expenses, profit, annual gear conversion loan payments and profit reductions per vessel under NPA 1, by fleet and vessel length class

	SAM East and West March 1 to July 31				
	Lobster			Sink Gillnet	
	Class I	Class II	Class III	Class I	Class II
Vessel Length (Feet)	< 35	36 and 49	> 50	< 40	> 40
Number of Vessels	108	66	19	14	46
Per Vessel					
Annual Revenues	29,900	120,200	740,900	154,200	273,600
Variable and Fixed Expenses	25,537	44,272	427,978	15,400	34,400
Profits w/out PA	4,362	755,929	312,922	69,400	119,200
Annual Gear Loan Payment					
LB	944	944	13,745	295	1,547
UB	2,833	2,833	28,902	514	2,420
Annual Profit Reductions					
LB	0.22	0.01	0.04	0.004	0.013
UB	0.65	0.04	0.09	0.007	0.020

Table 5.3.2.8
Total annual industry costs of converting to low risk gear and forgone revenues by fleet and vessel length class under non-preferred alternative 1 (NPA 1) plan.

		SAM East and West					
		Lobster			Sink Gillnet		Grand Total
		Class 1	Class II	Class III	Class I	Class II	
Vessel Length(Feet)		< 35	36 - 49	> 50	< 40	> 40	
Number of Vessels		108	66	19	14	46	253
Annual Payment	LB	944	944	13,745	295	1,547	
	UB	2,833	2,833	28,902	514	2,420	
Industry	LB		62,304	261,155	4,130	71,162	398,751
	UB		186,978	549,138	7,196	111,320	854,632
Rev in SAM East/West		8,700					
Industry		939,600					

Table 6.0.
Total forgone revenues for the lobster and sink gillnet fleet associated with DAM by area

		DAM	
		Lobster	Sink Gillnet
DAM	Area		
	1	1,302,000	1,101,240
	4	802,615	678,857
	5	352,760	298,367
	6	180,200	152,415
	7	205,324	173,511
	8	324,979	274,870
Total		3,167,878	2,679,260

Table 6.1.
Summary of cumulative effects of the Gear and DAM regulations prior to SAM, and the cumulative effects with SAM by fleet.

Fleets		Prior to this regulation Excludes SAM Gear 1997	Gear 2000	Gear 2001	DAM	Cumulative w/out SAM	Includes SAM Gear	DAM w/SAM	SAM	Cumulative w/SAM
Lobster	LB	129	191	849	3,168	4,337	1,169	325	153	1,647
	UB	276	539	3,915	3,168	7,898	4,730	325	320	5,375
Gillnet	PT	0.3	109	99	2,679	2,887.3	208.3	275		
	LB								43	526.3
	UB								75	558.3
Total	LB	129.3	300	948	5,847	7,224.3	1,377.3	600	196	2,173.3
	UB	276.3	648	4,014	5,847	10,785.3	4,938.3	600	395	5,933.3

Table 8.2.1
Summary of annual loan payments per vessel, and profit reductions under the preferred alternative (PA) and non-preferred alternative 1 (NPA 1) plan by vessel length class and fleet

	Length Class	Length	Annual Loan Payment LB	Annual Loan Payment UB	Profit Reductions PA SAM East May-July LB	SAM East May-July UB	SAM West March-April LB	SAM West March-April UB	NPA 1 SAM East/West March-July LB	NPA 1 SAM East/West March-July UB
Lobster										
	Class I	L<36	944	2,843			0.163	0.488	0.220	0.650
	Class II	35<L<50	944	2,483					0.010	0.040
	Class III	L>49	13,745	28,902	0.040	0.084	0.118	0.248	0.040	0.090
Sink Gillnet	Class I	L<40	295	514			0.003	0.014	0.004	0.007
	Class II	L>39	1,547	2,420	0.012	0.018	0.005	0.022	0.013	0.020

Table 8.2.2
Forgone revenues, annual gear loan payments, 3 year gear loan payments and the number of effected vessels under the preferred alternative (PA) and non-preferred alternative 1 (NPA 1) plan by fleet.

		PA			NPA 1		
		Forgone Revenues	Annual Gear Loan	3 Year Gear Loan	Forgone Revenues	Annual Gear Loan	3 Year Gear Loan
Lobster	PT	1,869			939,600		
	LB		151,195	453,585		323,459	970,377
	UB		317,922	953,766		736,116	2,208,348
Sink Gillnet	LB		42,949	128,847		75,292	225,876
	UB		67,396	202,188		118,516	355,548
Total	PT	1,869			939,600		
	LB		194,144	582,432		398,751	1,196,253
	UB		385,318	1,155,954		854,632	2,563,896
Number of Vessels							
Lobster		7	11		108	85	
Sink Gillnet			31			60	
Total for Alternative			49			253	

11.0 REFERENCES

ALWTRT. 2001. Draft Atlantic Large Whale Take Reduction Team Meeting Summary. Summary prepared by RESOLVE, Inc. and submitted to the National Marine Fisheries Service July 16, 2001.

Bisack, K. In review (2000). Estimates of the number of vessels and quantity of gear fished in the lobster and sink gillnet fleets from the Gulf of Maine to the Mid-Atlantic fishing grounds for 1999. Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA. 02543

Bisack, K. 2001. (Draft) Economic analysis of dynamic area management (DAM). Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA. 02543.

Gates, J. *et. al.* 1995. Design and development of an umbrella model of the north American lobster industry. Contract: 52EANF-2-00066. University of Rhode Island, Kingston, RI. 02881

Merrick, R.L.; Clapham,P.J.; Cole,T.V.N.; Gerrior,P.;Pace, R.M., III. 2001. Identification of seasonal area management Areas for North

Atlantic right whale conservation. Northeast Fish. Sci. Cent. Ref. Doc. 01-14;18p. Available from: National Marine Fisheries Service, 166 Water St., Woods Hole, MA 02543-1026.

Clapham,P.J.; Pace, R.M., III. 2001. Defining triggers for temporary area closures to protect right whales from entanglements: issues and options. Northeast Fisheries Science Center Reference Document 01-06. April 2001. Available from: National Marine Fisheries Service, 166 Water St., Woods Hole, MA 02543-1026.

[NMFS] National Marine Fisheries Service. 2000. Environmental Assessment of the Atlantic Large Whale Take Reduction Plan and Implementing Regulations. NMFS. Northeast Region. December 2000.

[NMFS] National Marine Fisheries Service. 2001. Preliminary estimates of the revenue losses to the gillnet and lobster fleet in 1999 due to potential dynamic area closures to protect right whales. NMFS. Northeast Region. March 2001.

[NMFS] National Marine Fisheries Service. 2001. Endangered Species Act section 7 consultation. Biological opinion regarding Fishery Management Plans for monkfish, spiny dogfish, and multispecies and Federal regulations for American lobster. June 14, 2001.

[NMFS] National Marine Fisheries Service. pers. comm. Communication with Gear Specialist at the Northeast Regional Office. National Marine Fisheries Service, Blackburn Road, Gloucester, MA